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COAL

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HEARINGS

BEFORE THE

SPECIAL SUBCOMMITTEE ON COAL RESEARCH

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

House

EIGHTY-FOURTH CONGRESS

SECOND SESSION

PURSUANT TO

H. Res. 400

TO AUTHORIZE A STUDY LEADING TO THE ESTABLISHMENT OF A RESEARCH AND DEVELOPMENT PROGRAM FOR THE COAL INDUSTRY

JUNE 4, 6, AND JULY 19, 1956

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COAL

MONDAY, JUNE 4, 1956

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE ON COAL RESEARCH OF THE
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The special subcommittee met, pursuant to House Resolution 400, at 10:05 a. m., in room 1324, New House Office Building, Hon. Ed Edmondson (chairman of the special subcommittee), presiding.

Mr. EDMONDSON. The Subcommittee on Coal Research will come to order.

I am pleased to see that the witnesses who are scheduled for this morning are present and ready. We also deeply appreciate their making available their prepared statements in advance of the hearing.

The purposes of the subcommittee have been set forth by a statement of purpose and objectives which was made public on May 18, 1956. If there is no objection, this statement of purpose and objectives, along with a copy of House Resolution 400, which the gentleman from Pennsylvania, Mr. Saylor, authored, and which the House passed last April, will be made a part of the record at this point.

Without objection, it is so ordered.

(H. Res. 400 and the statement follows:)

[H. Res. 400, 84th Cong., 2d sess.]

RESOLUTION

Resolved, that the Committee on Interior and Insular Affairs, acting as a whole or by subcommittee, is authorized to conduct a full and complete study on the possibilities of a research and development program for the coal industry of the United States. In particular, the committee or subcommittee shall seek to determine—

(1) whether or not there is a possibility of developing under existing law, a corporative research venture in which the Federal Government, interested and affected State governments, as well as industry, labor organizations and private corporations might participate; and ascertain what part the agencies might play in a research and development program and in what fields Federal or State governments might best cooperate;

(2) whether or not there is a possibility that an effective research program for coal might be developed in the same magnitude, and on the same general organizational basis, as those which have been and are now currently conducted by the Atomic Energy Commission, the National Advisory Committee for Aeronautics, the National Science Foundation, and similar groups;

(3) and investigate fields of research into which such a program might delve in order to accomplish the best and most expeditious results for an economic revival of the coal industry. Such fields of research should cover the general categories of coal production, coal transportation, coal distribution (market studies, and so forth), coal utilization in conventional forms, development of new and expanded uses of coal, including gasification, chemical production and a general appraisal of all coal technology;

(4) what progress has heretofore been made in the production of a synthetic liquid fuel in the overall energy program and what advances in our present knowledge and skills with respect to the production of synthetic liquid fuel may be reasonably anticipated in the future; and

(5) whether the public interest would be served by the construction of a plant for the conversion of coal into a synthetic fuel to permit more rapid development of techniques for the production of synthetic liquid fuels, since it is inevitable that the exhaustion or conservation of other fuels will require synthesis fuels to assume major importance in supplying the energy requirements of the Nation in time of war and peace.

The committee shall report to the House (or to the Clerk of the House if the House is not in session) as soon as practicable during the present Congress the results of its study, together with such recommendations as it deems advisable.

For the purpose of carrying out this resolution the committee or subcommittee is authorized to sit and act during the present Congress at such times and places within the United States, its Territories, and possessions, whether the House is in session, has recessed, or has adjourned and to hold such hearings as it deems necessary.

SUBCOMMITTEE ON COAL RESEARCH, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, HOUSE OF REPRESENTATIVES

Statement of Purpose and Objectives

(May 18, 1956)

OBSERVATIONS

The Subcommittee on Coal Research notes that—

1. The United States Geological Survey estimates that the United States, excluding Alaska, has 1,900 billion tons of coal reserves of all ranks—equal to one-third of the world"s reserves of coal.

2. With an abundance of coal available throughout the United States, enough to meet the Nation's requirements for many centuries, a once-thriving domestic coal industry has suffered a drastic decline through the loss of markets to other forms of fuels during a period of record-breaking prosperity for most American industries.

3. The United States production of coal dropped approximately 39 percent from a peak of 688 million tons in 1947 to an estimated 421 million tons in 1954. During the same 8-year period, there was a 45-percent decrease in the average number of mine workers from 497,782 in 1947 to an estimated 271,800 in 1954.

4. The coal industry has not been idle in its efforts to compete in the fuel markets. Improved coal technology from 1923 to 1954, inclusive, resulted in increasing mine productivity from 4.47 to 9.31 tons per man-day in bituminous and lignite coal mines and in reducing from 3 pounds to 0.99 pound the coal required by average generating plants to produce 1 kilowatt-hour of electricity and to a requirement of only 0.7 pound or less by the most efficient generating plants.

5. The United States now depends on coal for over 50 percent of the total electric power generated in the United States, and the use of coal for this purpose is increasing.

Coal is indispensable to the steel and foundry industries. Approximately 1.25 tons of coal, converted to coke, is required for making 1 ton of pig iron.

One-half of the coal produced in the United States in 1953 was consumed by electric-power utilities and coke plants in about equal amounts.

PURPOSE OF THE COAL STUDY

The subcommittee is acutely aware that the drastic decline in coal production has been disastrous to many mining companies and workers in and dependent upon the coal industry and that the economies of hundreds of communities throughout the Nation's 25 coal-producing States have been adversely affected. The subcommittee also notes that the condition of the domestic coal industry has a direct bearing on the welfare of several million Americans in peacetime and is vital to the defense of the Nation in time of war emergencies.

The subcommittee points out that it was in consideration of the foregoing factors that one of its Members, Representative John P. Saylor, introduced and the House of Representatives unanimously approved H. Res. 400, authorizing the study undertaken by the subcommittee.

It is the intent and purpose of the Subcommittee on Coal Research to seek to determine the possibilities that exist for developing such new and expanded uses for coal through research programs as would result in a stable and thriving coal industry. The study will include all ranks of coal—anthracitic, bituminous, subbituminous, and lignitic.

SPECIFIC OBJECTIVES

The Subcommittee on Coal Research will endeavor to obtain comprehensive information on coal with respect to—

(*a*) Industry problems;
(*b*) Recent developments and their possibilities;
(*c*) The status and possibilities of research and development programs now in progress;
(*d*) The possibilities of solving industry problems and creating new and increased uses for coal through additional and expanded research and development programs; and
(*e*) The requirements, feasibility, and degree of urgency of each program that may be recommended to the subcommittee, the facilities and personnel now available, and the means by which each program may be initiated and carried through to success, including the type and degree of private and public participation and methods of financing.

Each of these factors will be considered in regard to a number of subjects relating to coal, including, but not limited to—

1. Mining
2. Preparation
3. Handling
4. Marketing
5. Distribution
6. Transportation
7. Conventional uses
8. Combustion
9. Hydrogenation processes
10. Carbonization processes
11. Gasification processes
12. Oils and tars from coal
13. Coal chemicals
14. Miscellaneous coal processes and products

The subcommittee notes that the smaller and independent coal companies are those hardest hit by the drastic drop in the demand for coal and by other factors contributing to the unstable condition of the coal-mining industry. Consequently, the subcommittee is anxious to learn of any means within the reach of small enterprises, including promising processes requiring low capital investments, by which this segment of the industry may be strengthened and remain in business.

HEARINGS

The Subcommittee on Coal Research will hold as many hearings in Washington as are administratively possible between June 4 and the adjournment of Congress. Thereafter, a number of field hearings probably will be held.

Members of industry, labor organizations, trade associations, Federal and State agencies, other public and private research groups, and qualified individuals will be called upon to contribute their knowledge and suggestions to the subcommittee study.

Following a series of background hearings, the subcommittee will hold hearings to obtain more detailed information on subjects listed in the foregoing under "Specific objectives."

Mr. EDMONDSON. Does the chairman of the full committee, the gentlemen from California, have any statement he would like to make in advance of hearing the witnesses this morning?

Mr. ENGLE. I think not, Mr. Chairman. I would be willing, of course, to yield to the gentleman from Pennsylvania who authorized the resolution which authorized this inquiry by our committee.

Mr. EDMONDSON. We will hear from the gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Thank you, Mr. Chairman.

The hearings which opened today are a source of extreme personal satisfaction. As you know, I represent a coal producing district

and a large percentage of my constituents are dependent upon the production and transportation of coal for subsistence.

During my lifetime the coal industry has experienced so many periods of economic difficulty that I suppose most of us who have been close to the situation have at some time or another hoped to be able to make some constructive recommendation that might lead to a solution of the matter.

During and immediately following World War I, there were some 600,000 miners employed by the bituminous coal industry; as a matter of fact, the number rose to 704,000 in 1923. That was the high point of employment in the coal industry, and it is unlikely that any such figure will ever again be approached despite the fact that the demand for coal will double over the next two decades. What has happened is that the ranks of the labor force at our mines have in recent years been dropping off along the road of progress. My first recollection of the mining of coal goes back to the days when the pick and shovel were the identifying tools of mining operations. The old-fashioned type of horsepower was by far the most popular mode of transportation around the mines. The inartistic black tipple was a landmark in every mining town.

The use of machines to replace hand labor came into being before the turn of the century, but by far the most notable progress has been made within the past 10 or 15 years. Today monstrous electrical machines cut, load, and carry the coal from the working face to the main haulageway. As for the horses and mules, they went "thataway"—into the Valhalla of obsolescence. There is no place for them in modern underground factories. As for the tipple, it served its purpose well but now it is vanishing from the scene because science and research are replacing it with majestic coal preparation plants that not only wash the raw product but screen, size, and grade it as well.

A complete review of what has happened in the coal industry would, I believe, serve effectively as a preface to the activity of this committee, but I shall not attempt any such undertaking today. I wish only to point out that there has been a sharp decline in employment around the mines, and that a large part of it will never be restored. Our men whose services are no longer required because of the trend toward mechanization and automation do not expect this committee or any other committee to find ways of getting them back into the coal industry. The United Mine Workers of America have always welcomed new machines and new techniques that tend to increase productivity. They have enthusiastically participated in the program which enables ingenuity of a few skilled technicians to produce three times as much coal as the brawn of their forebears.

This committee is concerned, however, with the opportunities for that portion of the labor force which has remained in our mining communities to produce a fuel vital to the national welfare and security. We are interested in the industry to the extent that it will be able to continue its expansion plans so that coal will be able to assume a growing portion of the total energy load. I believe that through the work of this committee there may evolve the answers to the troublesome problems that have periodically confronted the coal industry and the coal miner in the past. There is no reason why the coal industry's

labor force—which now amounts to slightly more than 200,000—should not be able to look forward to steady employment as the Nation's energy demands rise sharply.

In conclusion, I should like to thank Chairman Engle of the full Committee on Interior and Insular Affairs for his interest and support of the resolution which has brought about the study now getting under way. I also wish to thank Chairman Edmondson of the subcommittee for his interest and for his devotion to this important task. I am also grateful to my other colleagues on the subcommittee. While our work is going to entail a great deal of time and energy, I feel that the results can provide a sense of great comfort to all of us. If we can open the door to steady employment, against the ups and downs that have prevailed in the past, we shall be affording new hope for a deserving segment of our population. At the same time, any progress in this direction will be a distinct contribution to the Nation's overall economy and to our defense structure. With God's help, those are the objectives which we want to accomplish.

Mr. EDMONDSON. I thank the gentleman for his kind remarks toward me and toward the other members of this committee. I am sure that all of us share in a sense of appreciation to the gentleman of Pennsylvania for the authorship of this resolution and for his interest in the coal industry. In my own district there are tremendous reserves of coal, and even in Oklahoma the reserves are estimated at over 50 billion tons. This is a tremendous natural resource which we feel is not being adequately utilized at this time. It is, I know, a matter of great concern to the people of Oklahoma, and I am very hopeful that this committee through its work will contribute at least in some small way for a better utilization of this great natural resource.

Does the gentleman from Colorado have any remarks he would like to make?

Mr. ASPINALL. I have no particular remarks, Mr. Chairman. I feel the same way as the gentleman from Pennsylvania and the chairman of our committee feel about the importance of this particular matter. My area has great coal reserves and has been affected adversely by the decline of the industry of late years. I am sure that anything we can determine that may be beneficial to the industry will be welcomed by the industry and by those who are affected.

Mr. EDMONDSON. Does the gentleman from Montana have any remarks?

Mr. METCALF. I have no comment at this time, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Utah?

Mr. DAWSON. I have nothing.

Mr. ENGLE. Mr. Chairman, may I make one observation? In traveling around the world—I have done a little bit of it—I have noticed that countries have not advanced because they do not have a low-cost energy source. Reading the memorandum before the committee recalls the observations I made in Spain where they are trying to get themselves out of the wilderness economically. I could not find any source of low-cost energy, no coal, no oil, and no hydro power.

Considering the vast resource of coal we have and the advancing requirements for low-cost energy, it seems to me it is a most important matter that we undertake in some way to implement these tremendous coal resources.

I observe that coal can be used to produce electricity on a very cheap basis, perhaps very much cheaper if we do a little further research on it. We know that atomic power as an energy source may be coming along, but we do not know how good it is going to be or we do not know how cheap it is going to be, and anything we do in this country which provides research, know-how, and moves in the direction of continuing a cheap source of energy is a tremendous contribution to the ability of our country to maintain the preeminence it has in world competition with other nations in industry, and our capability for defending ourselves.

So I think, Mr. Chairman, that this is a very important matter, and I hope this subcommittee, with the aid of industry and the Government, can make a substantial and beneficial contribution as to the utilization of this tremendous natural resource which is presently not being used to its maximum.

Mr. EDMONSON. I thank the gentleman.

The first witness scheduled to be heard this morning is the Hon. Felix Wormser, Assistant Secretary of the Interior for Minerals Resources.

Mr. Secretary, do you wish to have anybody sit with you for the purpose of answering questions?

Mr. WORMSER. Not at the moment, Mr. Chairman, but as your questions develop I may call on some of my staff.

Mr. EDMONSON. We are very pleased to have you with us this morning, Mr. Secretary, and thank you again for making your statement available in advance to the committee.

STATEMENT OF FELIX WORMSER, ASSISTANT SECRETARY OF THE INTERIOR FOR MINERALS RESOURCES; ACCOMPANIED BY THOMAS H. MILLER, ACTING DIRECTOR, BUREAU OF MINES; AND T. REED SCOLLON, CHIEF, DIVISION OF BITUMINOUS COAL, BUREAU OF MINES, DEPARTMENT OF THE INTERIOR

Mr. WORMSER. Thank you, Mr. Chairman.

Mr. Chairman, I am appreciative of the opportunity to appear before this committee to discuss with you the views of the Department of the Interior concerning coal research.

The Department is heartily in accord with the intent and purpose of the Subcommittee on Coal Research to seek to determine the possibilities that exist for developing such new and expanded uses for coal through research programs as would result in a stable and thriving coal industry within the United States. We welcome the opportunity to cooperate with this committee in this regard.

The Department of the Interior has a continuing interest in all phases of fuel resources, and has been particularly concerned over the status of the coal-mining industry. We are pleased to see that many of the problems with which the Department has been concerned will be discussed by this committee, not only with representatives of the Federal agencies, but with all concerned with the development of a healthy and prosperous coal industry.

As you know, a Cabinet committee, subsequently designated as the President's Advisory Committee on Energy Supplies and Resources Policy, was established by the President to prepare a report on energy

supplies and resources policies. The major recommendations of this report were released by the President on February 26, 1955. Recognizing that coal is a great national asset, the Advisory Committee endorsed "a cooperative study to determine what research and development could be undertaken." Much of the program envisaged by this recommendation places additional responsibility upon the Department of the Interior and, therefore, on the Bureau of Mines and the Geological Survey for the conduct of these studies.

In July 1955, the Director of the Office of Defense Mobilization requested the Secretary of the Interior to take the necessary steps to: (1) undertake a thorough and objective appraisal of the present status of research and development, (2) evaluate the effects various trends will have on future markets for coal and coal utilization technology, and (3) formulate, on the basis of these appraisals, a strong program of research and engineering development projects.

Subsequently, the Secretary of the Interior advised the Office of Defense Mobilization that such a study would be made, and this study will be discussed later.

The large future increases in total energy demand, which are predicted by all reliable investigators, can be met by expansion in the use of coal. To prepare for this anticipated greatly expanded energy market, new approaches must be applied to all phases of coal technology. A strong research program is required in the production, preparation, and transportation of this coal under safe mining conditions and with good conservation practices at economic prices. It is likely that much of the projected energy demand will be in the form of gaseous and liquid fuels, and the technology for the economic conversion of coal to these forms of energy still must be developed. Many of the processes that should be investigated may be uneconomic under present conditions, but would be feasible under a changed marketing economy. These studies cannot be delayed until the energy demand is pressing without seriously affecting the economic growth of the Nation.

The energy requirements that the Bureau of Mines has projected for the years through 1980 are shown on this chart, which shows quite an increase over the next 25 years or so. I do not know if you can see that chart from where you sit, but I shall be glad to pass it around later on for your inspection. It gives a very optimistic outlook for the energy requirements of the country.

Mr. ENGLE. It does not indicate, though, the anticipated source of energy to meet those requirements, does it, Mr. Wormser?

Mr. WORMSER. No. This is in bituminous coal equivalents. It does not show which particular fuel will supply that demand. That is correct, sir.

Mr. ENGLE. Do you have anything that indicates the projected availability of energy as against the projected energy requirements?

Mr. WORMSER. Some forecasts have been made, but I do not know whether the staff has any of those charts or tables with them.

We have some figures. If of interest to the committe, we will be very glad to show you what our thinking is on that.

Mr. ENGLE. I did not want to interrupt the continuity of your statement. Perhaps that will come along later. It seems to me that is important.

Mr. WORMSER. I think I can safetly say, Mr. Engle, that so far as the power requirements are concerned, generation of electric power, that coal is head and shoulders above all of the competing fuels because of the low B. t. u. costs of that form of energy. So I should say from that standpoint the outlook for coal is excellent.

I am informed that a study concluded 800 million tons of coal will be required before many years have passed to satisfy the power requirements alone of this country.

Mr. ASPINALL. I would like to ask Mr. Wormser this question: You made the statement that this particular fuel is far ahead of all other fuels. You make that in spite of the fact that you have not had very much extensive research work on some of the other fuels, such as oil shale and kindred fuels. Is that correct?

Mr. WORMSER. There has been research done in all of the fuels, Mr. Aspinall.

Mr. ASPINALL. Has it been extensive?

Mr. WORMSER. I do not think it has been extensive in all fields.

Mr. ASPINALL. Has it been conclusive?

Mr. WORMSER. In what particular, Mr. Aspinall?

Mr. ASPINALL. In arriving at the answers.

Mr. WORMSER. Of course, all these fuels seek to obtain as large a share of the market as they have available. They are all competitive, and they serve various markets. Coal serves the power market. It has lost a good part of the household market, whereas oil has taken over a lot of the household market, and gas has come in for certain specialized uses.

Mr. ASPINALL. Go ahead. I did not wish to interrupt.

Mr. WORMSER. It is a balancing of a great many factors, Mr. Aspinall, that in the last analysis determines what fuel gets a certain market.

Mr. EDMONDSON. Do you want to go ahead with your statement, Mr. Wormser? We will be interrupting you from time to time.

Mr. WORMSER. That is perfectly all right, sir. My statement is almost finished anyway.

Other studies made in response to requests regarding the peacetime uses of atomic energy have all indicated that the energy requirements for 1975 will be approximately 2.5 billion tons of bituminous coal equipment. In the past many of the predictions regarding energy consumption in the United States have turned out to be extremely conservative. In any event, if coal were to continue to supply only its present proportion of total energy requirements, by 1975 approximately 750 million tons of bituminous coal would be required. However, other studies have indicated that with a vigorous research and development program coal could be expected to assume a larger proportion of this total future energy demand. The chart indicates if coal's proportion is only 40 percent of the total energy demand in 1975, approximately 1 billion tons of bituminous coal will have to be mined. This chart, however, does not indicate the form in which the energy will be used.

A large proportion of these energy requirements will be in the form of gaseous and liquid fuels, of which the domestic reserves are much smaller than those of coal, so that one may expect the deficiencies in these energy forms in the future will be made up by the conversion of coal to gaseous and liquid fuels. The time when it will be econom-

ical to convert coal to gaseous and liquid fuels will depend upon advances made in the technology of carrying out these processes.

These problems have been under continuing study by the Department of the Interior, and following the request of the Office of Defense Mobilization, a rather complete study of future energy requirements and the status of coal research was undertaken by the Bureau of Mines in cooperation with Bituminous Coal Research, Inc. This study resulted in Bureau of Mines Information Circular 7754, copies of which have been made available to members of the Subcommittee on Coal Research.

The report indicates that relative to other major industries the funds expended for research and development on coal are small, but that vast opportunities exist for developing the technology to insure adequate markets for coal. This particular report does not emphasize geologic problems and does not cover anthracite. However, the Department of the Interior, through the Geological Survey, is continuing its appraisal of national coal resources and its coal-mapping programs, and is doing extensive research work on the mechanism of formation of coal and its constituents. The Bureau of Mines and the Geological Survey have been working diligently on problems of anthracite, because of the depressed conditions in the anthracite industry. Last year Congress approved the expenditure of matching funds with the State of Pennsylvania for the control of water entering anthracite mines, and an agreement has been worked out with the State of Pennsylvania for carrying out this program. Moreover, new and more intensive research on developing improved mining methods for the difficult mining conditions in the anthracite area and for discovering new uses for this valuable natural resource is underway.

As with all other natural sciences, there is a shortage of competent trained personnel in all phases of coal research. Every effort should be made to increase the supply of geologists, fuels technologists, mining engineers, chemists, chemical engineers, and others necessary to carry out a large expanded coal research program. A knowledge that increased emphasis will be placed on coal research in the future may encourage the formation of a reservoir of capably trained personnel.

Mr. EDMONDSON. Mr. Secretary, at that point I would like to ask you a question concerning the personnel of the Bureau which you head that is in the field of coal research. How does your present staff, in terms of numbers and qualifications, compare with the staff, say, of 5 years ago? Have you an enlarged staff? Have they been enlarging the personnel of your Bureau?

Mr. WORSMER. Inasmuch as you are asking for a historical comparison, I think I will ask Acting Director Tom Miller, who is here with me, to answer that.

Mr. EDMONDSON. Very well.

Mr. MILLER. I do not have the exact figures. I could state in a general way that the total staff on fuel research is smaller than it was 4 or 5 years ago. It has been reduced because the large demonstration plant operations in synthetic liquid fuels was shut down. Those actually working on coal research other than synthetic fuels, I believe have increased in that period.

I could supply for the record the exact number involved. I do not have it here this morning.

Mr. EDMONDSON. I think for the record if you could give it to us over the past 5-year period.

Mr. MILLER. I will be very glad to.

Mr. EDMONDSON. Both in the synthetic fuel branch working on the use of coal in that area and also on coal research specifically.

Mr. MILLER. We will prepare them that pay.

Mr. WORSMER. Production in bituminous coal in 1955 exceeded the fondest expectations of the most optimistic observers. Electric utilities, industrial consumption, and steel took substantially more coal, while exports were doubled. This trend has continued into 1956. With firm determination and cooperation, however, much can be done now by the coal industry, not only to regain some of the lost solid fuels market, but to obtain even a greater share of the strongly increasing demands for fuel energy. Among the more important of these is an expansion of research in all phases of coal technology. Opportunities exist for research from the discovery and extension of reserves through the development of new uses for coal in the fields of gaseous and liquid fuels.

I requested the Bureau of Mines to review its coal research program to se if any of its current programs could be redirected toward more productive lines of research. However, it appears that more emphasis will be required in order to carry out the responsibilities of this Department in coal research.

Subject to the stringent budgetary limitations, the Department will review the coal program to determine how more emphasis may be placed on this important national problem. Let me assure you that the Department of the Interior recognizes the need for a more intensive research coal program and again let me say that it welcomes the opportunity to cooperate in any possible way with this committee to establish a sound program of coal research.

I will be pleased to answer any questions that you have concerning my statement. I have here with me today technical personnel from the Geological Survey and the Bureau of Mines who will present more detailed testimony on the various phases of coal research and will be pleased to answer any questions which the committee may raise.

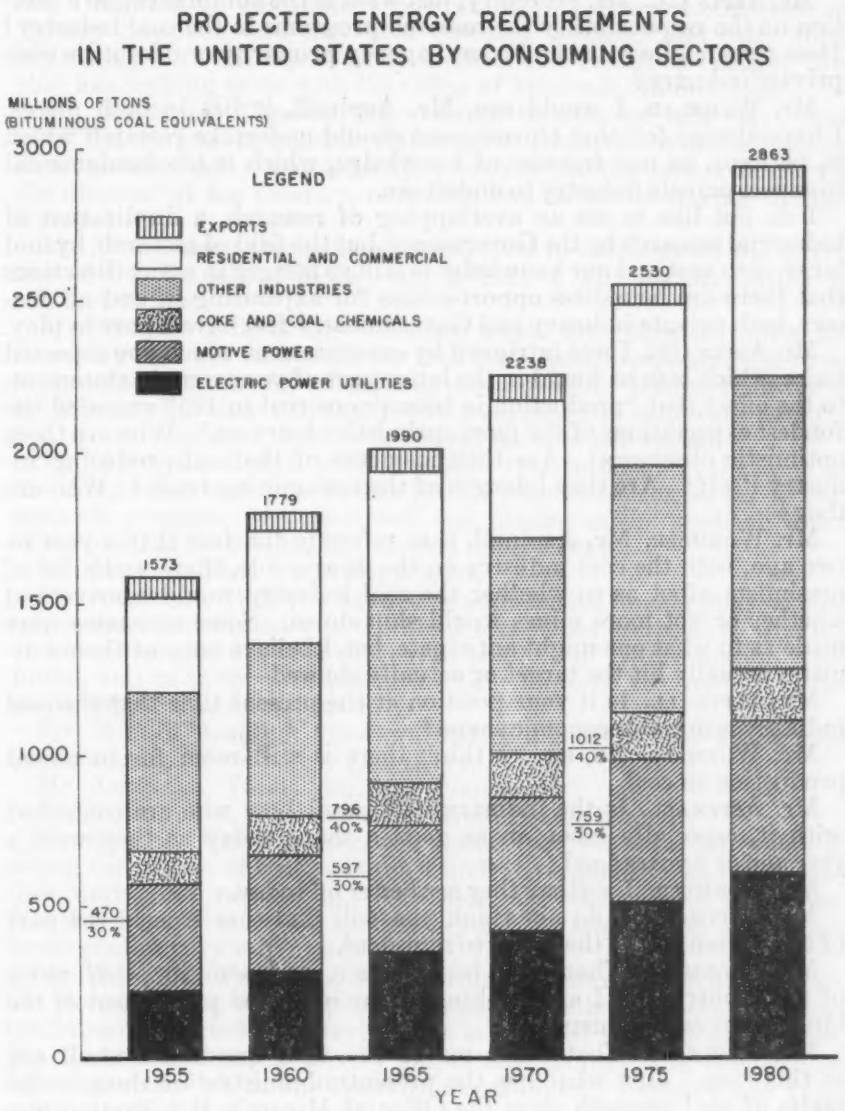
In that connection, Mr. Chairman, may I suggest that inasmuch as the question of our reserve position in coal, how much we have ahead of us, always crops up and is, of course, a factor in appraising what type of research should be undertaken, perhaps we call on one of our experts from the Geological Survey so that we can have once and for all established in the record.

Mr. EDMONDSON. We will do that as soon as we put some questions to you.

At this point I would like to ask unanimous consent that the chart which has been placed before the committee may be reproduced in black and white for inclusion in the printed record.

Without objection, it is so ordered.

(The chart follows:)



Mr. EDMONDSON. The gentleman from Colorado.

Mr. ASPINALL. Mr. Secretary, just what is the administration's position on the responsibility for research programs in the coal industry? Does research lie with the Federal agency primarily or does it lie with private industry?

Mr. WORMSER. I would say, Mr. Aspinall, it lies in both places. I have always felt that Government should undertake research which is, perhaps, on our frontier of knowledge, which is too fundamental to expect private industry to undertake.

I do not like to see an overlapping of research, a duplication of industrial research by the Government, but the field of research, by and large, is so vast and our knowledge is still so meager in many directions that there are boundless opportunities for expanding it, and all factors, both private industry and Government, I feel have a part to play.

Mr. ASPINALL. I was intrigued by one statement which you repeated twice, which is to be found in the latter part of your written statement, to the effect that "production in bituminous coal in 1955 exceeded the fondest expectations of the most optimistic observers." Who are those optimistic observers? Are they members of the coal-producing industry itself? Are they laborers of the coal-mining trade? Who are they?

Mr. WORMSER. Mr. Aspinall, that refers to the fact that a year or two ago, with the coal industry on the downgrade, there was a lot of pessimism afoot as to whether the coal industry would survive and whether or not more mines would shut down. Some estimates were made as to what one might anticipate, but I believe none of these estimates actually hit the target or actually showed——

Mr. ASPINALL. Is it your position at the present time that the coal industry is in good economic shape?

Mr. WORMSER. No, sir. I think there is still room for increased production in coal.

Mr. ASPINALL. Is the industry itself and those who are connected with it, especially labor, in as good a shape today as they were a year ago or 2 years ago?

Mr. WORMSER. I will say they are better off today.

Mr. ASPINALL. I do not think you will find that true in the part of the Nation I have the honor to represent.

Mr. WORMSER. That may be true, sir, and also in other parts of the country, but I am thinking of the increased production of the bituminous coal industry.

Mr. ASPINALL. That takes me to the final question I shall ask at this time. Just what has the present administration done in the realm of coal research since the Office of Minerals Mobilization was organized and began its work?

Mr. WORMSER. Mr. Aspinall, the Office of Minerals Mobilization has nothing to do with coal research.

Mr. ASPINALL. I thought you made reference to it here in your statement.

Mr. WORMSER. The Office of Minerals Mobilization?

Mr. ASPINALL. Maybe it was Defense Mobilization.

Mr. WORMSER. I think I see what you are driving at, Mr. Aspinall. I referred to the Office of Defense Mobilization.

Mr. ASPINALL. All right.

Mr. WORMSER. The Office of Defense Mobilization was charged by the President to chairman the President's Cabinet Committee on Energy Supplies, and they held repeated meetings and came forth ultimately with the report early in 1955, as I recall, on energy. But that has nothing to do with the Office of Minerals Mobilization.

Mr. ASPINALL. Then let my question be directed this way: Just what has the present administration in the Department of the Interior done toward coal research looking toward finding new avenues for the disposal of the product, new uses, and so forth—during the last 2 years?

Mr. WORMSER. I think there we will have to delineate all the activities of the Bureau of Mines, and I think I will ask Mr. Miller to respond to that.

Mr. MILLER. I think the witnesses which are going to follow the Secretary will get rather deeply into these questions, particularly on anthracite research and bituminous coal research. Rather than try to anticipate what they will say, I would suggest you may want to withhold your question until the technical matters are raised.

Mr. ASPINALL. I will withhold with this statement: that one of the things that was done earlier in this administration as far as coal research program was concerned was closing down, shutting down of the plant at Louisiana, Mo. Is that not correct?

Mr. MILLER. That is correct, yes, sir.

Mr. ASPINALL. Will you have some explanation during your presentation as to the reasons why the plant was closed down, as to whether or not all of the answers that were possible of determination were found, and as to the possible future benefits to be acquired from the reopening of this sort of research?

Mr. MILLER. I do not know we will be able to answer all of your questions, sir, but we will be glad to try.

Mr. ASPINALL. Thank you, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. Mr. Wormser, you stated that you were interested in seeing the phases of coal research which the committee had indicated they were going to take up. Are there any other phases which you feel this committee should go into beyond the ones which we put out in our preliminary statement?

Mr. WORMSER. Perhaps it is not germane to the question of research, but it does have a very important impact, I believe, on the future of the bituminous-coal industry, and it is more of an economic nature, but something I think is very important, namely, the competition internationally which the American coal-mining industry has from other countries that have socialized their coal-mining industry and are operating in the red so that they are indirectly subsidized by their own governments and make it difficulty for our own industry to compete in the export trade. Beyond that, too, as you know, Mr. Saylor, last year at least one country had a barrier against the importation of American coal, and, thanks to the efforts of the State Department, we were able to have that barrier knocked down. So it did facilitate the export of coal. That is not with specific reference to technical research, but I think it is very important for the future prosperity of the coal industry.

Mr. SAYLOR. The reason I ask that: The statement prepared by the committee was not intended to be exclusive of any other phases, and if

anyone has any other avenues which we should investigate, I know that the committee would be most happy to have those avenues presented to us.

Mr. WORMSER. As you know, sir, we have endeavored to survey the entire field of coal research, and I met informally with representatives of the industry and our own people, and we prepared a report which I think delineates about as well as you can expect many of the opportunities there are in coal research. I believe the commitete has already been supplied with that information.

Mr. SAYLOR. That is Circular 7754?

Mr. WORMSER. That is right, sir; 7754.

Mr. SAYLOR. Mr. Wormser, you stated that studies on gaseous and liquid fuels from coal could not be delayed until there was a shortage in those in the present form. Would it be your opinion that the Bureau of Mines would have charge of research or should they direct the research?

Mr. WORMSER. I should like to see the Bureau of Mines be the focus of all the research which the Government does in that particular line, Mr. Saylor. I think with their performance over the years, their knowledge of the industry, their technical proficiency, they are ideally equipped to carry that on or to direct it.

Mr. SAYLOR. But if the Bureau carried on extended research, you would not be averse to having similar research carried on or allied research being carried on by the universities in our country?

Mr. WORMSER. Not allied research, but I would rather regret to see any unnecessary duplication.

Mr. SAYLOR. I would agree with you we do not want to have any duplications. I think that the Bureau of Mines is well equipped to be the one which would handle the overall picture, but I certainly do not believe they should be the ones which should handle all of the research.

Mr. WORMSER. I doubt, sir, if Congress would be willing to appropriate the money necessary to go into all of those programs because it would run into the hundreds and hundreds of millions of dollars to go through all of the programs that are suggested in that information circular you have there.

Mr. SAYLOR. Do you believe that the industry itself should undertake under your direction some phases of this research?

Mr. WORMSER. Not under our direction, sir. I think they should be given a completely free hand to undertake the research which in their judgment would be most apt to create benefits for them individually.

Mr. SAYLOR. If that is the case, how can we avoid the duplication which you refer to?

Mr. WORMSER. I know the Bureau of Mines works closely with industry and they are quite aware of what is going on currently in industry. And I think by the same token industry knows pretty well what the Bureau of Mines is doing. I do not think there is any particularly difficult problem to coordinate the fields of research there.

Mr. SAYLOR. On page 5, you have talked about the shortage of geologists, mining engineers, chemical engineers. Mr. Wormser, in the foreseeable future, will our educational institutions be in a position to relieve that shortage both for our Nation at large and for the Bureau of Mines, in your opinion?

Mr. WORMSER. I certainly hope so, Mr. Saylor, because it is one of the Nation's most difficult problems, not only from our own particular governmental responsibilities but also the responsibilities that industry has to further the progress and prosperity of the Nation. It is an extremely serious problem and a lot of it stems from the fact that we have not enough youngsters going into engineering and scientific lines, and some way has to be found to attract them in the high schools right at the basis of scientific careers and then carry them on to the universities and to either private industry or into Government activities.

Mr. ASPINALL. Will my colleague yield at that place for a question?

Mr. SAYLOR. Yes.

Mr. ASPINALL. Mr. Wormser, what is your thinking as to whether or not the research work should be carried on with personnel of the Federal Government or whether or not the Federal Government should operate more by contract with those people and those agencies qualified—not saying that Government personnel might not be qualified, but speaking of personnel outside of the Government who are qualified to do the work?

Mr. WORMSER. I think that has a part to play in this whole research problem, Mr. Aspinall. But what concerns me there: Unless you contract with somebody who already has the necessary personnel to pursue a particular avenue of research, you are apt to find them depending upon Bureau personnel or even raiding the Bureau to get the necessary technical personnel to carry on the program.

Mr. ASPINALL. That is what happens in the ultimate, anyhow. Is that not true?

Mr. WORMSER. It could very well occur unless you happen to have a private agency, a university, for example, which already has the scholastic staff, career staff, presumably, who could carry on. But I am thinking more of the private laboratories.

Mr. ASPINALL. Have you not found it to be your experience heretofore that the Government, when it has these research programs, trains the individual, and then just as soon as the individual gets up to the place where he becomes very effective, private industry steps in and takes him way from you?

Mr. WORMSER. It certainly is a steppingstone to industry, the training that these technicians and scientists and engineers receive in the Bureau of Mines and elsewhere in government.

Mr. ASPINALL. It is not your thought that the personnel could not be trained by the private operators just as they are trained by the Government?

Mr. WORMSER. They could be trained privately, surely.

Mr. ASPINALL. Thank you, Mr. Saylor.

Mr. SAYLOR. What you are saying, Mr. Wormser, is that there is nothing unique in the Bureau of Mines. Many people come to Washington in various fields and have gotten some experience with the Government and then become enamored with positions outside of the Government.

Mr. WORMSER. I think that is true, Mr. Saylor.

Mr. SAYLOR. That is all at this time, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Montana.

Mr. METCALF. No questions.

Mr. EDMONDSON. The gentleman from Utah.

Mr. DAWSON. I have one question, Mr. Wormser. What is the present status of your plants at Rifle, Colo., and other plants you have set up to convert coal to liquid fuels?

Mr. ASPINALL. If my colleague will yield right there. That has only to do with oil shale. The Louisiana plant in Missouri was for coal and that closed down 3 years ago.

I think, in answer to the first part of the question, the Secretary will have to say that there has been no money appropriated so far by Congress to carry on any operation or even standby protection for the oil shale facility at Rifle for the next year. Is that right, Mr. Secretary?

Mr. WORMSER. That is correct, Mr. Aspinall.

Mr. DAWSON. I am glad the gentleman informed me. I thought they might be doing some coal research there. They are in Missouri, you say?

Mr. ASPINALL. They were 3 years ago, but they have done nothing in the last 3 years.

Mr. WORMSER. That is correct.

Mr. DAWSON. What is the reason for that?

Mr. WORMSER. The Louisiana, Mo., demonstration plant, that is what you refer to, Mr. Dawson?

Mr. DAWSON. Yes.

Mr. WORMSER. That happened before I was with the administration, but I believe the reason for that is the vast size of that operation. It seemed to be the feeling of the administration, as supported by Congress, that this had become too large a project, that it was all right to go to a laboratory stage or even to a small pilot-plant stage, but beyond that it was desirable for the Government to step out.

Mr. ASPINALL. Will my colleague yield further?

Mr. DAWSON. Yes.

Mr. ASPINALL. It resolved itself into whether or not the Government would carry on a test-tube operation, or, in case of an emergency, a pilot plant, or whether the Government would continue to carry on demonstration plant facilities. Is that not correct?

Mr. WORMSER. That about sizes it up, Mr. Aspinall.

Mr. ASPINALL. What happened after some 3 or 4 years of operation at Louisiana, Mo., was that they had no more answers than they had when they started, to wit, the answers which the German scientists had found out before we entered into our last war with them. Is that not true?

Mr. WORMSER. I think that is true, and also the fact this whole Louisiana project had grown to such a size it anticipated a situation which was not apt to materialize for a great many years, maybe 15, 20, or 25 years. So it was way ahead of its time, and it was not necessary to carry the work to the vast size of the Louisiana operation.

Mr. DAWSON. When was the plant closed?

Mr. WORMSER. April 1953, I am informed.

Mr. DAWSON. Do I understand what you are saying, then, is that you found a roadblock or you went as far as you could go and now you are tossing the torch to private researchers?

Mr. WORMSER. Private industry.

Mr. DAWSON. To carry on from there.

Mr. WORMSER. As a matter of fact——

Mr. DAWSON. This is one case where there is no duplication as indicated by your testimony a few minutes ago, where you are asking

then private industry to take it on from there, the Government is through?

Mr. WORMSER. The Government is through on this scale; yes, sir. Right.

Mr. ASPINALL. If my colleague will yield there. I think it goes deeper than that. I think that there is a difference of policy involved here. I think that it should be recognized by this committee, as far as that is concerned, the Louisiana program was carried on, and in the minds of Congress until it was shut down we thought we were getting results. Apparently there were no results forthcoming. We are involved in this particular situation, that is a competitive field, in the thinking of those who are in charge of these programs.

Now Congress has not had too much to say, Mr. Wormser, relative to the closing down of the Louisiana plant or the closing down of the Rifle oil-shale plant. We have pretty well been boxed in by the lack of justification made in each instance by the governmental agencies and the disapproval of the Bureau of the Budget to carry on these programs. Some of us have been unable to find out whether or not we were misled up to the time they were closed down, or whether or not there has been a fundamental change in policy which just does not permit continuation of such work by the Government. That is the reason I asked the question in the first place about the policy of this administration.

Mr. WORMSER. I am not too familiar——

Mr. ASPINALL. You do not have to answer that. It was not necessarily a question.

Mr. DAWSON. I would suggest you do answer it if you care to.

Mr. WORMSER. Unfortunately, Mr. Dawson, I do not know too much about the Louisiana episode, which occurred before I joined the administration. I would be very glad to look into it if it would assist the committee, or perhaps some of the staff here can be of assistance. I must confess my own inability to give you a helpful answer.

Mr. SAYLOR. Will the gentleman yield?

Mr. DAWSON. Yes.

Mr. SAYLOR. Mr. Wormser, in answer to the gentleman from Colorado, it has been my understanding that the Louisiana plant merely put into effect in this country a system which the Germans had developed, and the net result was that we found that what worked in Germany works in the United States if you do it exactly the same way, and there was not any research actually done out there at all.

Mr. ASPINALL. If the gentleman will yield. It depends on what you call research, whether or not a demonstration plant is a research operation. The gentleman's understanding, though, is correct. We got no place. We spent some $45 million or something like that and had nothing to show for it as far as answers, apparently.

Mr. SAYLOR. The only answers I ever heard anybody in the Bureau say was, what kept Germany operating for the last few years of the war, if you go over and duplicate it in this country and duplicate it to its last detail, will work here. And that is just what happened.

Mr. ASPINALL. And under the present situation, with the competitive forces as they are, it is not economically feasible to carry on that sort of a program.

Mr. SAYLOR. That is correct.

Mr. ASPINALL. In industry.

Mr. SAYLOR. In industry.

Mr. DAWSON. I simply want to say, Mr. Chairman, that seeing all of these automobiles we have up and down the roads and the amount of fuel we are using for planes in increasing amounts, and considering the fact that the great State of California, which is one of the big oil producers, is now importing gasoline and oil leads me to the conclusion it has about reached the time when we had better be moving ahead on some of these fuel processes to be sure we were going to be ready, because the time is approaching when we are going to find we are way behind. It is going to really be an economic catastrophe if we are not ready to move ahead on some of these synthetic fuel programs before we reach the end of the road.

Mr. WORMSER. Of course, Mr. Dawson, we have huge oil reserves elsewhere in the world, and we are on an import basis right now in the oil industry, and probably will be.

Mr. DAWSON. Yes, we are depending too much on that world supply. We are going to reach the point where, if we get into trouble with the enemy, we are not going to be able to get an oil supply into the country. It is about time we paid a little more attention to developing our own potential right here in this country. That is my view.

Mr. WORMSER. I think you will find when the time is propitious for the conversion of coal into petroleum or some petroleum derivative it will be done by private industry. I feel they know enough right now to do it, but it is a question of economics. It cannot be done today, as I see it, and compete with the natural sources of petroleum.

Mr. DAWSON. That is the thing that disturbs me on this residual oil controversy. If we depend on residual fuel oil to come in here and get the coal mines out of business, we are going to find ourselves with flooding mines and a very serious situation when we cannot any longer depend on that foreign source of supply. It seems to me our principal emphasis should be on the developing of our own resources in this country rather than depend on the foreign sources.

That is all, Mr. Chairman.

Mr. EDMONDSON. The gentleman from California.

Mr. ENGLE. No questions.

Mr. EDMONDSON. The gentleman from Nebraska.

Dr. MILLER. I am not a member of your committee. I appreciate the opportunity to ask questions. I was interested in Mr. Wormser's testimony on the apparent theory or thought which developed as to show who should do the research. Do you think it is the primary responsibility of Government to go out and do all the research and then turn it over to industry? I thought I got that thinking here from some of the questions that were asked.

Mr. WORMSER. I certainly do not, sir. I think that the Government should confine its research to those fundamental projects that you cannot expect private industry to undertake because of the very fact that there is no immediate profit motive involved and yet is a necessary item of research to add to human knowledge.

Dr. MILLER. Of course, private industry has proceeded at a very rapid rate and consistent rate in developing and research work.

Mr. WORMSER. They do an enormous amount of research every year.

Dr. MILLER. How long was the research work carried on at Rifle, Colo.? How long did that experimental work continue?

Mr. WORMSER. I understand it started about 1943, Dr. Miller.

Dr. MILLER. During that 10 or 12 years of time we developed about all the knowledge we needed upon how to extract that oil from the shale, and followed a certain technique that had been developed in Germany. It could be done, the oil could be used, but it was an economic problem instead of how to get it out. Is that correct?

Mr. WORMSER. I think the proof of the pudding is the fact that private companies already are stepping into that area and planning to put up their own pilot plants and subsequently larger ones.

Mr. ASPINALL. Will my colleague yield?

Dr. MILLER. Yes.

Mr. ASPINALL. I just wish to take part at this place to bring to the attention of the committee and Dr. Miller the fact you did not have the answers for the resource which was being developed at Rifle, Colo., and that what the Union Oil Co. will be doing at their new plant in Grand Valley, Colo., is perhaps a process just the reverse or the opposite of the program carried on at Rifle. Is that not true, Dr. Miller?

Dr. MILLER. Mr. Aspinall, the plant which Union Oil Co. is now constructing is substantially different than the retorting process developed by the Bureau of Mines.

Mr. ASPINALL. That is right.

Dr. MILLER. The basic principle is still the same, to heat the shale to derive oil.

Mr. ASPINALL. We have been doing that since 1921.

Dr. MILLER. That is correct. Whether or not the Union Oil retort will be more successful than the Bureau of Mines developed retort remains to be seen. We will have to test to find out.

Mr. ASPINALL. But you did not finally test the retort. That is what my statement was. You did not finally test the retort which you had in operation at the Rifle demonstration plant. You closed it down, or Congress did, or whoever did—we closed it down. We will accept our responsibility—before the answers were arrived at.

Mr. MILLER. Before the testing had been completed. There were other tests that had been scheduled for that equipment; that is correct.

Mr. ASPINALL. Thank you, Dr. Miller.

Dr. MILLER. Of course, as I recall when we visited the plant some years ago, there were several universities that were also carrying on research work. I presume they supplied some valuable information relative to the breaking down of the shale and production of oil. California is carrying on some research work at several universities.

I appreciate the opportunity of asking these questions.

I hope the special subcommittee will delve deeply into this question. I have always been a great believer in research. I think any progress we have made in this country, whether in the field of food technology or medicine or coal, comes about because we have inquiring minds asking questions of nature and seeking the answers. That is nothing more than research. Sometimes it is rather baffling to start to break down the secrets that nature holds, but we are doing it and making great strides in doing it. Undoubtedly there is still a big field ahead in the coal industry that they can make tremendous progress for the benefit of mankind by research they will carry on.

I do feel the Government should always stimulate research but they should not be the prime one doing that research. We do not have

enough money to do that. But we should never put any stumbling blocks in the way of free enterprise to carry on research. We should never act in a capricious or bureaucratic manner in trying to stop research in whatever direction it may happen to go. That is one of the big problems—keeping Government in balance with industry.

Thank you.

Mr. EDMONDSON. The gentleman from Colorado, Mr. Chenoweth.

Mr. CHENOWETH. Mr. Wormser, I am interested in your statement at the bottom of page 5 concerning the increase in the production of bituminous coal which you say exceeded your fondest expectations in 1955 and carried over into 1956.

Could you give us a little more specific information on just what that increase was, how substantial it was, what the prospects are? I do not care to have you go into minute details, but I am interested.

Mr. WORMSER. May I ask Mr. Scollon who has those figures in hand to step up to the table? I have it right here.

Mr. CHENOWETH. Just a brief statement.

Mr. WORMSER. Bituminous coal production in 1955 amounted to 470 million net tons, an increase of some 20 percent over 1954 when the lowest production since 1938 was experienced. The war peak in bituminous coal production was 620 million tons in 1944, and the alltime high occurred in 1947 when 631 million tons were produced. Production of bituminous so far in 1956 is running about 17 percent ahead of last year's rate of production.

Mr. CHENOWETH. What is the reason for that increase, Mr. Wormser?

Mr. WORMSER. I think it is due to a combination of factors—increased domestic utilization, but also quite a strong surge in export of coal.

Mr. CHENOWETH. How much of that increase has been export business and how much increased domestic consumption?

Mr. WORMSER. As I recall, we exported approximately 51 million tons last year.

Mr. CHENOWETH. You mentioned here that exports were doubled. I do not know what they were before they were doubled in 1955.

Mr. WORMSER. When Mr. Scollon testifies I think he can go into greater detail.

Mr. CHENOWETH. Maybe I should not pursue it further now.

Mr. WORMSER. I will be glad to give you the export figure.

Mr. CHENOWETH. I would be curious to know what the export figure is. If you do not have it there, I do not want to take up too much time, Mr. Wormser.

Mr. WORMSER. I think you will find his statement goes into great detail and gives the exact figure. I cannot put my finger on it right at this moment.

Mr. CHENOWETH. We have been dealing this morning largely with the question of experimental technical development in the use of coal. I also am interested in the immediate increase in consumption of coal in this country. Some of these technological processes will probably take some years to perfect. I am sure my colleague from Pennsylvania, Mr. Saylor, when he introduced the resolution also had in mind the stimulation of the present production and consumption of coal and some immediate results because he represents a large coalfield I also represent a very large coalfield, the largest coal-producing area in

Colorado. I have seen the coal mines decline in recent years very, very rapidly to where they are now down to a very small percentage of the number of mines we had a few years ago.

I just wonder about the possibilities of stimulating the coal industry aside and apart from the experimental and technological developments which we have been talking about. Are the prospects rather encouraging for an immediate increase in consumption of coal?

Mr. WORMSER. I believe they are, sir. It has been very interesting to me to see the developments that have taken place in the Ohio Valley in the construction of two large aluminum plants which depend in the last analysis upon cheap power. They have not turned to gas and oil or water; they have turned to coal. And these plants are designed to be in operation for a long time to come, and coal has won out. While they are not built yet, it certainly means in the future large consumption of coal for that area.

Mr. CHENOWETH. What are the prospects for the export business to continue?

Mr. WORMSER. I think the export business will continue, but, as I said a moment ago, I am rather dismayed or rather anxious to see something done about the fact that we have to compete as American coal producers with socialized or nationalized coal industries abroad. When you have a nationalized coal industry you find the Government willing to pick up the check, and these coal industries are running at a loss.

Mr. CHENOWETH. What countries receive most of this coal?

Mr. WORMSER. Canada, Germany, Italy, France, and England. We have quite a lot of countries on the list.

Mr. CHENOWETH. What percentage went to the Pacific; do you recall?

Mr. WORMSER. In 1955, from January to December, we exported to North and Central America 17,273,000 net tons; to South America, 1,500,000. These are rough figures I am giving.

Mr. CHENOWETH. Yes.

Mr. WORMSER. In Europe, roughly 29 million tons. And in Asia, 3,700,000. A grand total of exports of 51 million tons.

Mr. CHENOWETH. You had nothing to do with the purchase of the coal in that program?

Mr. WORMSER. No, sir.

Mr. CHENOWETH. Who handles the purchase?

Mr. WORMSER. The ICA did a lot, made a lot of the arrangements.

Mr. CHENOWETH. Were you consulted at all?

Mr. WORMSER. I think we had a minor part in this, Mr. Chenoweth.

Mr. CHENOWETH. The only reason I mentioned it, I think our coal producers in Colorado are somewhat disappointed they did not get to participate in that program to any extent at all.

Mr. WORMSER. Perhaps too far inland, I suppose.

Mr. CHENOWETH. I just wondered if the program could not be adapted so that all of the coal-producing areas might benefit a little by this huge expenditure of Federal money which is going into this program. I think it might create a little better feeling in the coal industry if that could be done. I know there was considerable disappointment in the program among our Colorado producers.

I believe that is all, Mr. Chairman.

Mr. EDMONDSON. Mr. Aspinall has further questions.

Mr. ASPINALL. I would like to return to my question about the position of the Office of Minerals Mobilization and go forward with my questions.

I wish to say that in the 83d Congress we passed a Domestic Minerals Extension Act which dealt with the strategic basic minerals. That is known as Public Law 206. Then in the 84th Congress we passed the act known as H. R. 6373 which was reported by the committee, and at the same time we were given to understand that the new Office of Minerals Mobilization would deal with the problem of the domestic minerals industry.

The President apparently thought so because in his veto message he made the following statement, and I quote directly:

> I am conscious of the desirability of developing a long-range minerals program for the United States to assure an adequate mobilization base and to preserve a sound minerals economy. The Advisory Committee on Minerals Policy so advised and the Office of Minerals Mobilization has been established in the Department of the Interior to determine and recommend such a program. Funds to make the necessary studies have just become available and work toward the development of a long-range program has begun.

On February 21, 1956, the head of the Office of Minerals Mobilization, Mr. Spencer Shannon, appeared in New York at the annual meeting of the American Institute of Mining and Metallurgical Engineers and said, and I quote from his statement at that time:

> In passing, I should like to clarify an apparently widespread misunderstanding of the functions of the Office of Minerals Mobilization. Some people have the impression that the Office has responsibility for long-term mineral policy. The Office has no such responsibility. The only job the Office has is with respect to minerals and solid fuels mobilization. Any assistance the Office can give to the domestic industry must rest squarely on grounds of national preparedness.

In light of those statements, Mr. Secretary, just what is the responsibility of the Office of Minerals Mobilization in the solid fuels or coal industry?

Mr. WORMSER. Purely in the mobilization field, Mr. Aspinall, from a defense standpoint: How much coal do we need in wartime? How we are going to get it? How we are going to keep the mines going? What construction may we anticipate? And other mobilization problems that relate to an adequate supply of coal in wartime.

Mr. ASPINALL. But in case of an energy shortage in wartime—and we are led to believe although we are comparatively peaceful at the present time we could have trouble immediately—is there not a responsibility of some kind there for the Office of Minerals Mobilization to step into further study of the solid fuels program?

Mr. WORMSER. Absolutely, so far as mobilization problems are concerned, and they are doing that currently, Mr. Aspinall.

Mr. ASPINALL. Is it not impossible to just really divide what may be called a normal production program and a possible wartime program as far as looking forward and planning for the possibility of an abnormal situation in the occurrence of war?

Mr. WORMSER. There are so many factors involved, Mr. Aspinall, in keeping any industry going and doing its part in any wartime situation that——

Mr. ASPINALL. In other words, your position here this morning is that under the Office of Minerals Mobilization, which rests under your

secretaryship, there is no immediate responsibility as far as the solid fuels program is concerned. Is that correct?

Mr. WORMSER. So far as research is concerned, Mr. Aspinall. As I understand it, we are here today discussing this resolution which applies to research. So far as other responsibilities are concerned the Office of Minerals Mobilization has responsibility definitely, but not on research, sir.

Mr. DAWSON. May I ask another question?

Mr. EDMONDSON. The gentleman from Utah.

Mr. DAWSON. As I understand what you are saying is that the Office of Defense Mobilization is just what it says it is—a mobilization of existing resources?

Mr. WORMSER. Precisely.

Mr. DAWSON. And it does not involve you getting out and going into research in all of these fields, which would probably embark you on a course that would go far beyond what was ever intended in the Defense Mobilization Act.

Mr. WORMSER. Precisely. As a matter of fact, the President's Committee on Energy Supplies, which is under the chairmanship of Dr. Flemming, who heads the ODM, specifically made a remcomendation that more research be done on coal. As I understand it, today we are considering this research aspect.

Mr. DAWSON. That is all.

Mr. EDMONDSON. Mr. Secretary, I just wondered if you have available along with the figures on personnel during the past 5 years the figures on appropriations for the purpose of coal research, both under coal itself and under coal research dealing with synthetic liquid fuels. Do you have those figures?

Mr. WORMSER. We have all of that, sir, and I am sure some of the succeeding witnesses will be very glad to provide that for the record.

Mr. EDMONDSON. We would like to have those in the record if they are not covered by subsequent witnesses.

Mr. MILLER. It may be that subsequent witnesses will introduce that this morning. If not, we will certainly put it in the record.

(The material referred to follows:)

Expenditures by Bureau of Mines for coal research

Year	Coal except synthetic liquid fuels	Synthetic liquid fuels (coal portion of program)
1952	$2,060,000	$5,539,200
1953	1,997,063	5,483,300
1954	2,472,558	2,655,600
1955	1,860,000	2,285,200
1956	1,937,030	2,830,040

Mr. EDMONDSON. Fine. We would like to have it very much.

In that regard, I know on examination of the figures which I have—and I will look to see if they are confirmed by your figures—that there has been—and I think you commented on it—a decline in the funds being expended for coal research dealing with synthetic liquid fuels over the last 5 years. Has that been a matter of budgetary limitation, which you mentioned in your statement, or has it been a matter of policy determination?

Mr. WORMSER. I would say it is a matter of both, Mr. Chairman. It has been both policywise and also budgetary.

Mr. ASPINALL. Will my chairman yield?

Mr. EDMONDSON. Yes.

Mr. ASPINALL. It has also been a matter, has it not, Mr. Wormser, of the inability of the Bureau to justify further sums in their appearances before the Appropriations Committees?

Mr. WORMSER. That certainly has had a bearing on the decision which was ultimately made; yes, sir.

Mr. EDMONDSON. Have you been requesting consistently substantial sums of Congress for this purpose or have there been reductions in your requests for this purpose?

Mr. WORMSER. We have tried to have our own requests dovetailed with the overall amounts the Department would be allowed to request for its various activities.

Mr. EDMONDSON. The gentleman from Pennsylvania mentioned a statement which you made on page 3 that these studies cannot be delayed until the energy demand is pressing without seriously affecting the economic growth of the Nation.

Subsequently, I notice you said on a later page:

> Opportunities exist for research from the discovery and extension of reserves through the development of new uses for coal in the fields of gaseous and liquid fuels.

You apparently feel pretty strongly that there should be an expanded research program in this particular field.

Mr. WORMSER. Precisely.

Mr. EDMONDSON. Are you planning to request additional funds for this purpose?

Mr. WORMSER. We are. Just as soon as we have had a chance to survey the entire field and can determine just where our area of responsibility lies and where industry's responsibility lies, we shall make up a program that will express the Department's best views on what we should do. Such a program, of course, would have to be in accord with that of the President.

Mr. EDMONDSON. Could we anticipate a request for supplemental appropriation in this field?

Mr. WORMSER. Not for a supplemental; no, sir.

Mr. EDMONDSON. Not in this Congress?

Mr. WORMSER. Not in this Congress.

Mr. EDMONDSON. So you do not anticipate any chance of completing that survey in the field, then, before 1957?

Mr. WORMSER. I am afraid not, sir.

Mr. EDMONDSON. Are there any further questions? Mr. Miller, do you have a prepared statement?

Mr. MILLER. I do not. Mr. Scollon, I believe, is the next witness for the Bureau. I believe the suggestion was made that the Geological Survey testify on coal reserves next to get that part of the picture.

Mr. EDMONDSON. Thank you, Mr. Secretary.

Mr. WORMSER. Thank you.

Mr. EDMONDSON. We will be glad to hear from Mr. Ralph L. Miller of the Geological Survey.

STATEMENT OF RALPH L. MILLER, CHIEF, FUELS BRANCH, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Mr. MILLER. Mr. Chairman, I am Ralph L. Miller, Chief of the Fuels Branch, Geological Division, Geological Survey, United States Department of the Interior. I have with me a staff geologist of the Fuels Branch, Mr. Paul Averitt, whom you may wish to call on if you have questions after I have read my prepared statement.

The Geological Survey has been engaged in studies of coal for more than 70 years. During this long period we have continuously recognized that coal has been and still is a main bulwark of the national economy, not only as an assured sources of low-cost heat, but also as a vital source of coke. More recently it has assumed new and important national significance as a source of numerous chemicals, and as a potential source of synthetic liquid fuels and lubricants, whenever needed.

The numerous problems that currently beset the coal industry are complicated by a wide variety of economic and social factors that are not susceptible to treatment on a single front. As this committee has emphasized, these problems must first be isolated and analyzed, and then a many-pronged attack must be mounted to deal simultaneously with as many problems as possible. Fortunately, as Secretary Wormser has pointed out, the future of the coal industry is bright, and many of the immediate problems can be ameliorated in time by a carefully planned program of research. Research on methods of mining, preparation, marketing, and distribution of coal, and a broad spectrum of research on the technology and use of coal, undoubtedly represent areas where great advances can be made, and I wish to endorse subsequent statements to be presented in support of such research.

At this time, however, I should like to discuss coal as a black rock in the ground, and to describe the type of research that is needed before the coal can be used beneficially. In the ground coal is essentially valueless; it acquires value only through exporation and study of its geologic dimensions and properties, and its subsequent removal. In discussing this subject I should like to outline ways in which the utilization of coal is affected by its geologic mode of occurrance, and ways in which increased knowledge of the occurrence of coal through the medium of geologic research benefits the coal industry and the Nation.

Coal occurs as tabular or lens-shaped bodies intercalated with layers of sandstone, shale, or limestone. The individual beds vary greatly in thickness and continuity; in content of ash, sulfur, and fixed carbon; in the number and thickness of partings; and in other properties important in determining minability or ultimate use. The coal beds in any sequence of rock tend to converge or diverge from parallelism at many localities, and they may range from flat lying or gently undulating, as in most parts of the United States, to very steeply dipping, or even overturned, as in the Pennsylvania anthracite beds.

The roof rock on individual beds, or parts of beds, may range from hard, firm sandstone to soft, weak shale. The one makes a firm roof for underground mining, but an expensive overburden to remove for

strip mining. The other makes a weak or impracticable roof for underground mining, but an economical overburden to remove for strip mining.

Some coal beds are underlain by a clay suitable for manufacturing brick and clay products; other coal beds contain small amounts of germanium, uranium, and other metals that may have ultimate value.

In planning a coal-mining operation it is important to know the direction, amount, and variations in dip of the coal beds and associated permeable beds as a factor in planning for the removal of underground water. It is important to know the direction of bed thickening or parting thickening as a guide in planning mine extensions. It is necessary to know the nature of the roof rock as an index of the cost of removing the coal, just as it is necessary to know the coal composition as an index of the salability of the coal. It is manifestly desirable to know of possible profitable byproducts that might be removed with the coal. Many of these factors are ascertained during the course of geologic field investigaitons, and each factor determined in advance improves the chance of a protfiable mining venture.

I will speak now of geologic field investigations.

The detailed geologic field investigations that yeld this useful and practical information are a basic part of the work of the Geological Survey—they are designed to yield knowledge of all coal beds of possible economic value in the United States and Alaska. The investigations are conducted by geologists who map the thickness, extent, attitude, roof and floor rock, and overburden of each coal bed; collect samples for the purpose of determining the composition of the bed; study the composition and texture of the intervening rocks; and record information that will lead to an understanding of the environmental history of the coal and the enclosing rocks and the regional correlation of the individual coal beds, as a guide to their extent and continuity. To the information obtained by field mapping is added mine and drill data provided by coal companies; chemical, botanical, and petrological data obtained from laboratory examinations; and the total, integrated study is published as a report, including maps, tables, and an accompanying text.

This record of a completed investigation is made available to all interests simultaneously by publication, and constitutes a valuable reference for present and future use. Currently we have detailed coal work of this type in progress on 16 projects in 9 States and Alaska. Five of these projects are in areas of potential coking coal, which is less abundant in the United States than other kinds of coal, and which is in greatest demand because of its coking properties, high heat content, and other desirable properties.

The detailed geologic field investigations yeld other data that are used for two additional purposes that I should like to discuss under the headings "Coal Reserves" and "Paleobotanical and Petrological Research."

COAL RESERVES

Concurrently with our program of detailed geologic field investigations we have been engaged for the last several years in preparing on a State-by-State basis new estimates of the total coal reserves of the United States.

Data gathered as part of geologic field investigations, and obtained from records of mining companies, State agencies, and private individuals, are used to prepare estimates of coal originally present in the ground, from which other types of estimates can be derived. When compared with records of production and mining operations, for example, estimates of original reserves can be used to obtain figures on the percentages of coal recovered and lost in past mining operations, and this in turn can be used to estimate the probable amounts available for future use. The accumulated information for States, counties, or other geographic units is used in appraising the total energy potential of the Nation, in long-range planning for the overall utilization of our coal resources, and in more immediate planning for the industrial development of selected areas.

The first considered estimate of the total coal reserves of the United States was prepared by M. R. Campbell of the Geological Survey in the period 1909 to 1913, and published with minor revisions during subsequent years. Campbell's estimate was based necessarily on many assumptions concerning the thickness and lateral extent of coal beds in areas for which few geologic data were then available. The estimate included all coal in the ground in beds more than 14 inches thick, under less than 3,000 feet of overburden, without attempting to distinguish between reserves of thick, easily accessible coal, and reserves of thin, deeply buried coal. Although adequate as a first appraisal, the Campbell estimate is too generalized and too inaccurate in the light of more recent knowledge to be of present practical value.

Mr. ASPINALL (presiding). Mr. Miller, I would like to interrupt for a point of information at that point.

Mr. MILLER. Yes.

Mr. ASPINALL. In the Bureau of Mines Information Circular 7754, to which our attention has been drawn this morning, there is a table on page 11 shown as "Table 7—Coal reserves of the United States, January 1, 1953, by States."

If I have numbered them correctly, there are approximately 27 States that are listed, and the reserves which are given for 11 of those States were made by this Campbell report before 1928, and yet you make the statement in your testimony here this morning that we cannot depend upon this offering by Mr. Campbell. Is that correct?

Mr. MILLER. That is correct.

Mr. ASPINALL. In other words, the table to which I refer then is not accurate and must not be considered as accurate?

Mr. MILLER. It is accurate in part, sir. We have been engaged in reappraising the coal reserves of the important coal-producing States. A considerable part of that study has been completed and new estimates are available.

Mr. ASPINALL. Let me ask this further question then: The 16 States on which new studies have been made, are the figures accurate as to those 16 States?

Mr. MILLER. The figures are accurate based on information available today; yes, sir. The figures are in general more conservative and reduced figures from the Campbell estimates.

Mr. ASPINALL. Mr. Saylor has a question.

Mr. MILLER. We have brought here for distribution, if the committee members would like to see it, a copy of the Coal Resources of

the United States, which gives the data for all States that had been completed up to October 1, 1953.

Mr. ASPINALL. Could you advise us on what page we will find the similar material to which I made reference? Or does it appear on any table? It appears at page 4; is that correct?

Mr. MILLER. Yes; this will be on page 4, table 1.

Mr. ASPINALL. Are we to understand that the material that is set forth on page 4 is up-to-date with surveys made within a reasonably short time before the date of January 1, 1953?

Mr. MILLER. Yes.

Mr. ASPINALL. You may continue. Thank you.

Mr. MILLER. In the current Geological Survey program to re-estimate the coal reserves of the United States, primary emphasis is being placed on the amounts of coal in separate categories according to rank, thickness of beds, thickness of overburden, and relative abundance of reliable data available for preparing the estimates, because such detailed information is needed in planning for the proper utilization of reserves. In preparing the new estimates we have set up standard procedures for analyzing the data used in making the estimates, and for determining the categories in which the results are reported. As a consequence, the new estimates are more conservative than the older estimates, and the reserve figures tend to be considerably smaller. Completed to date as part of this current coal program of the Geological Survey are new detailed estimates for Indiana, Michigan, Montana, New Mexico, North Carolina, North Dakota, South Dakota, Virginia, and Wyoming; and new provisional estimates for Colorado, Georgia, Maryland, and Oregon. In addition, new estimates have been prepared for Kansas and Illinois by State agencies, and new estimates of reserves in 32 counties in the Appalachian Basin have been prepared by the Bureau of Mines. Work is currently in progress by the Geological Survey on new estimates for Oklahoma which is in press, Alabama, Arkansas, Colorado, eastern Kentucky, and for two counties in Pennsylvania.

Using new data wherever available and the older Campbell data where necessary, the remaining coal reserves of the United States as of January 1, 1953, totaled 1,900 billion tons, and the recoverable reserves total half this amount, or 950 billion tons. This is divided by rank as shown in the accompanying table and there follows here a table which is a summary of the larger one in the circular that you have. Alaska has additional reserves in each of the ranked categories of coal.

(The table is as follows:)

Remaining coal reserves of the United States, Jan. 1, 1953

Rank	Estimated total reserves remaining in the ground, Jan. 1, 1953, in billions of short tons	Estimated recoverable reserves, Jan. 1, 1953, assuming 50 percent recovery	
		In billions of short tons	In quadrillions of B. t. u.
Bituminous coal	1,050	525	13,643
Subbituminous coal	373	186	3,543
Lignite	463	232	3,105
Anthracite and semianthracite	14	7	178
Total	1,900	950	20,469

One of the most interesting and provocative factors brought into the open and emphasized by the recent intensive work on coal reserves is the fact that when large areas are considered, the past average overall recovery of coal in underground mining in the United States has been only about 50 percent of the coal originally present in the ground. The remainder is left underground as pillars in and around the mined areas, as rider beds, and as thin or impure parts of the main bed. Additional amounts are left in folded and faulted areas, or areas where the roof rock is difficult to support. Other amounts are left under towns, railroads, roads, and streams, and in restricted areas around oil and gas wells. Inasmuch as many efficiently operated underground mines recover 80 to 90 percent of the coal in the block being mined, it seems entirely possible that by the more general application of efficient mining principles the average, overall recovery in underground mining in the United States could be raised to about 65 percent, which would thus represent a significant increase in recoverable reserves.

Another point brought out by coal reserve studies is the fact that reserves of low-volatile bituminous coal constitute only about 1 percent of total reserves. Low-volatile bituminous coal is very strongly coking, and is used extensively in blends with weakly coking high-volatile bituminous coal to make coke of the desired quality. Low-volatile bituminous coal is thus the "sweetener" that makes possible the use of our vastly larger reserves of high-volatile bituminous coal in manufacturing coke. Considering our long-term need for low-volatile bituminous coal, the fact that it is in relatively short supply and that it is used in large quantities for steam raising and other less exacting purposes, are a matter for immediate concern.

In late 1953 we prepared a summary report on the status of coal reserve information in the United States, which is still reasonably up to date. I have distributed copies of this report.

Mr. ASPINALL. Mr. Miller, let me interrupt you there. I notice that the chart on page 5 of the report to which you just made reference is identical to table No. 7 of Circular 7754. With that in mind, perhaps you might wish to make just a little different answer to the question that I asked as to whether or not it was more up to date than the other one, because apparently it is the same chart.

Mr. MILLER. Perhaps I confused the dates to which you were referring. This chart in the Bureau of Mines information circular is, I believe, identical with the one in Circular No. 293 in which some of the estimates for the States are the old Campbell estimates of about 1913 vintage, and the new estimates that were completed and reported in this October 1953 one are carried over into the table in the Bureau of Mines circular.

Mr. ASPINALL. Which means, of course, that there are at least 11 of those States on which no work has been done at all since 1928 in determining reserves?

Mr. MILLER. Work is being done in most of those States now, but the reserves studies have not been completed.

Mr. ASPINALL. All right.

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PALEOBOTANICAL AND PETROLOGICAL RESEARCH

Mr. MILLER. A broad, continuing program of research into the origin, composition, and properties of coal and lignite also is carried out by the Geological Survey in both field and laboratory. Each of the detailed geologic field investigations described above has as part of its objectives the determination of the physical and chemical properties of the coals, and the geologic events that have affected each coal bed and its properties during and since the time of deposition. To this end we maintain a special coal geology laboratory that is equipped to examine, describe, and interpret the plant fossils and constituents of coal and the enclosing rocks as revealed by microscopic study. When the distinguished paleobotanical and petrological characteristics of a coal bed have been ascertained, the information may be used immediately to establish correlations between widely spaced outcrops, and thus provide a basis for predicting the nature and quantity of coal in the intervening areas. At the same time it is hoped that ultimately the distinguishing paleobotanical and petrological characteristics can be related to chemical and physical properties that now must be determined empirically.

The Coal Geology Laboratory engages also in the systematic study and classification of a wide range of plants, spores, and constituents of coal, for ultimate use in deciphering the stratigraphic and geologic history of coal-bearing areas, and in determining the ecological conditions relating to coal origin.

In addition to the Coal Geology Laboratory, we maintain a chemical laboratory in which the occurrence of a number of minor elements in coal and coal ash, such as germanium and uranium, are investigated by chemical, spectroscopic, and other means, with the objective of determining the source and mode of emplacement of the material, and possibly locating economically recoverable deposits. As a result of this work, a deposit of lignite has been found in the Dakotas that is rich enough in uranium to be mined as uranium ore.

RESEARCH NEEDS FOR THE FUTURE

In the past, our geologic work on coal has been weighted, quite necessarily, in favor of mapping coal-bearing regions and in the calculation of coal reserves. We shall need to continue these detailed mapping studies in the important and potentially important coal basins of the country. We shall need also to complete the study of the Nation's coal reserves by making appraisals for those remaining coal-producing States for which no modern or detailed estimates are available.

In recent years we have been moving toward a more intensive study of the origin and constitution of coal, and the environment of coal deposition. Such studies will aid greatly in establishing correlations between various coal outcrops; in predicting variations in the thickness and quality of individual beds, and of partings and roof rocks; in relating distinguishing paleobotanical or petrological characteristics with chemical and physical properties; and in understanding the origin and concentration of minor elements in coal. A considerable increase in this type of work on the origin and composition of coal will be necessary if the basic information is to be available that is

needed to realize maximum value from technologic studies on production and use of coal.

Although we already expend a fair proportion of our work on coal with coking properties, it seems to me that we should try to increase these efforts, particularly in the areas of low volatile bituminous coal.

In our work on coal we try to keep informed of the trends in the use of coal, and of the probable future needs for coal, as a guide in formulating our own program. Similarly, we maintain close contact with other agencies engaged in work on coal as a means of insuring maximum benefit from our combined efforts. We welcome the opportunity afforded by these hearings to join in an exchange of views on this important subject, and we welcome advice and recommendations from this group or other informed sources.

CONCLUSION

In conclusion, I should like to say that I believe this study to be most timely. I feel sure that the review of problems facing the coal industry and the consideration of suggested solutions will have an immediate stimulating effect on those interested in the industry. And I know that any subsequent program of research that may come as a result of these studies will yield far-reaching and continuing benefits, not only to the coal industry, but also to the users of coal and to the country at large.

Thank you, sir.

Mr. ASPINALL. Thank you very much, Mr. Miller, for a very fine statement.

As I understand it, what you term to be your research activities go to the determination of the amount of reserves, the kinds of the coal, and the possibility of recovery of all coal that is practical to recover. Do you go any further than that?

Mr. MILLER. No. In fact, we do not go quite that far. The recovery of coal from the ground is a function of the Bureau of Mines. But the geologic occurrence of the coal in the ground, its nature, its rock association, its composition, its origin, and its amount, its quantity, is a function of the Geological Survey.

Mr. ASPINALL. Of course, I did not mean taking the coal from the ground, but I meant the kind of formation that was found in place and so forth.

Mr. MILLER. Yes.

Mr. ASPINALL. That is part of your research?

Mr. MILLER. That is correct.

Mr. ASPINALL. There is one other question which I have. That is, are you receiving enough consideration from Congress to carry on your research program with what you term to be sufficient practicability? In other words, are you going as fast as you can go and do it well?

Mr. MILLER. In recent years our level of coal research has maintained a rather uniform quantity. We have neither increased nor decreased the amount of research that we are doing. We need to complete the reserve appraisal of the Nation and that should be done in a matter of several more years if the same level of effort continues to go into it. We need to continue the detailed mapping of important coal fields throughout the country; and, as the needs of industry show

up in various parts of the country where heavy industry has not previously been active, the detailed knowledge of the coal is a matter of very considerable importance in guiding mining. So that I believe the effort in the mapping of coal fields could to advantage be stepped up.

We also need from the geologist's standpoint to learn more about the fundamental nature of coal, its special properties and its minor constituents. Very little has been done either in my organization or elsewhere in this field, and the specialized uses to which coal can be put go back fundamentally to the original nature of the coal and the geologic history to which it has been subjected in coming to its present form. Research on this fundamental nature of coal, I believe, should be increased. It is at a very low ebb now.

Mr. ASPINALL. My final question is, Have you made requests for such stepped-up program?

Mr. MILLER. In the coming fiscal year the level of research and the amount of funds is at the same level as this fiscal year. There is, I believe, under consideration an expansion of effort in coal research for the following fiscal year, fiscal 1958.

Mr. ASPINALL. The gentleman from Pennsylvania.

Mr. SAYLOR. Mr. Miller, I want to congratulate you on the statement you have made, which will be a great deal of help to the committee.

Could you tell us what nine States you are now working in and project for your further investigation in the field?

Mr. MILLER. Our detailed field investigations. I can supply a full list. I can run through them and see whether I get the nine. We are now working in Pennsylvania, in eastern Kentucky, in northeastern Tennessee, in Alabama, in Montana, in Colorado, New Mexico, Arizona, and completing work in Oregon. I am not quite sure whether that made nine or not.

Mr. SAYLOR. I have noticed that in this report which you have referred to, Circular 293, the maximum depth that you have overburden has been limited to 3,000 feet.

Mr. MILLER. Yes.

Mr. SAYLOR. Have you found, or do you know if there is coal located at depths below 3,000 feet?

Mr. MILLER. Yes; there is.

Mr. SAYLOR. Why has the Bureau not gone into places with an overburden of more than 3,000 feet?

Mr. MILLER. This is because of the economic picture with regard to coal. Coal being a bulk commodity, its removal from under the ground is one of the major cost items. In addition, the water problem becomes greater from drainage down to keep levels in a mine the deeper you go. As a result, when we set up the criteria for the categories that are shown in this coal research study it was our feeling—and I believe this thinking is still valid—that coal deeper than 3,000 feet would not be economic in the foreseeable future. So we have limited our research calculations to that which seemed to be of practical significance to the Nation—shallower than 3,000 feet.

Mr. SAYLOR. Was that conclusion concurred in by the Bureau of Mines and the other related agencies of the Government?

Mr. MILLER. You may have before you, sir, shortly, the Bureau of Mines people. To the best of my knowledge, this is concurred in everywhere.

Mr. SAYLOR. If the method of mining is changed so that the retreat method of mining is used rather than the present room mining method, would your figures be increased proportionately by the greater recovery that is made in the long-wall or retreat method of mining?

Mr. MILLER. Yes, sir. The remaining reserves of coal will not be changed. Those figures will stay the same. They are based on what was originally in the ground. But the figures for recoverable reserves will be changed beneficially.

You will note in this circular that, based on past experience, the amount of coal recovered is very close to 50 percent. So in arriving at the figures of recoverable reserves, we have merely used this 50-percent figure of the total coal that was in the ground. As a result, any improvement in mining practice will increase the remaining recoverable reserves of coal.

Mr. SAYLOR. I was interested in seeing that you break your figures down to the thickness of beds of 14 to 28 inches, and 28 to 42 inches, and above 42 inches.

Mr. MILLER. Yes.

Mr. SAYLOR. What is the thickest seam of coal that the Department has ever discovered?

Mr. MILLER. The thickest one in this country that I know of is a lignite bed in Lake DeSmet, Wyo., which is on the order of 130 to 140 feet thick. I do not recall the exact thickness.

Mr. SAYLOR. Is there any rock strata between that, or is that a solid seam?

Mr. MILLER. That is essentially solid lignite, but unquestionably it has some partings in it. In other words, it probably could not be mined throughout as a solid seam.

Mr. SAYLOR. What is the overburden of that?

Mr. MILLER. It crops out at the surface in an area of a reservoir, and it descends at a rather gentle angle, so that its overburden will be continuously changing from the outcrop, getting deeper and deeper as it passes beneath the ground.

I might qualify my statement on the thickest coal bed.

In areas of tight folding of coal as in the anthracite region of Pennsylvania, the coal gets compressed in the bottom of the so-called synclines, to geologists, and there there are areas where coal has been squeezed into these troughs where even more than 140 feet of solid coal are present.

Mr. SAYLOR. Am I correct that the only true anthracite is found in the northeastern end of Pennsylvania?

Mr. MILLER. The only true anthracite in quantity. In some of the Western States some coalfields have been intruded by later igneous molten rocks, and the effect of the heat on the coal beds has metamorphosed small amounts of coal to anthracite, but the quantities are very small compared with the Pennsylvania anthracite.

Mr. SAYLOR. That is all.

Mr. ASPINALL. The gentleman from Colorado.

Mr. CHENOWETH. I agree with my colleague that you made a very fine statement.

I want to ask one question about the amount of work you are putting on coal with coking properties. You mentioned you are spending a fair proportion of your work now on that and want to increase those efforts.

Mr. MILLER. Yes.

Mr. CHENOWETH. Why do you make that statement? Do we need more coal of coking properties? Or what is the situation?

Mr. MILLER. Of the coal now being utilized, to us the most critical one in terms of supply of long range seems to be the high quality coking coal. This is both an overall national picture and also a regional one in terms of having coking coal in the right place where you can afford to ship it to the steel mills. So that we feel, inasmuch as this seems to be the most critical possible shortage of coal to this country, that we should find out as much as possible about all coking coal or potential coking coal that could be blended.

Mr. CHENOWETH. Is coking coal now in short supply?

Mr. MILLER. It is in short supply in the Western States in areas where it is needed without expensive haulage.

Mr. CHENOWETH. Where are our greatest fields of coking coal?

Mr. MILLER. The greatest fields of coking coal are in the Appalachian Basin, the States of Pennsylvania, eastern Kentucky, West Virginia, and down into Tennessee having the greatest quantity of coking coal and the best coking coal.

Mr. CHENOWETH. We have a pretty substantial field in southern Colorado, do we not?

Mr. MILLER. Yes; there is.

Mr. CHENOWETH. Used by the steel plant of the Colorado Fuel and Iron Corp. at Pueblo.

Mr. MILLER. Yes.

Mr. CHENOWETH. I think they also are shipping some coking coal to the American Smelting & Refining Co., I believe some of their plants.

Mr. MILLER. I think that is the largest field of coking coal west of the Mississippi River, if I remember correctly.

Mr. CHENOWETH. I think that is all.

Mr. ASPINALL. Thank you very much, Mr. Miller.

Mr. MILLER. Thank you.

Mr. ASPINALL. Mr. Secretary, we thank you and those who appeared with you this morning for your cooperation with this committee.

The committee will meet this afternoon at 2 p. m. to hear representatives from the National Coal Association.

Are there any further questions of those who appeared this morning.

May the Chair make this inquiry, Mr. Secretary?

Do Mr. Tom Miller and Mr. Scollon have additional information to give to us?

Mr. WORMSER. Yes, sir. I think the committee will find it very useful to have this evidence.

Mr. ASPINALL. We shall take your testimony first then at 2 o'clock, to be followed by representatives from the National Coal Association.

The committee will stand in recess.

(Whereupon, at 12:01 p. m., the special subcommittee recessed until 2 p. m. this same day.)

AFTERNOON SESSION

Mr. EDMONDSON. The Subcommittee on Coal Research will be in order.

Unless there is objection, we will proceed to hear the prepared statement of Mr. LaViers, and then return at the conclusion of that statement to the witness for the Department, for whom we have a number of questions.

STATEMENT OF HARRY LaVIERS, CHAIRMAN, COMMITTEE ON RESARCH AND DEVELOPMENT, NATIONAL COAL ASSOCIATION

Mr. LAVIERS. Thank you, Mr. Chairman. I am happy to have the opportunity to appear before the committee. I have a prepared statement. My name is Harry LaViers. I live in Paintsville. I am president of the South-East Coal Co. of Paintsville, Ky. I appear before this committee as chairman of the National Coal Association's committee on research and development. The National Coal Association is the national trade organization of the bituminous coal-mine owners and operators of the United States. Our member companies produce more than two-thirds of all commercially produced coal in the United States. Our organization speaks for a great majority of the bituminous coal industry, including practically every major producing company. A number of our member companies are located in the States represented by the gentlemen of this subcommittee.

The coal industry is appreciative of the interest in our industry's welfare which has been, and is now, evidenced by the Congress so ably represented in this hearing by the gentlemen of this subcommittee. It is our understanding that the current hearings, commencing today, are for the purpose of securing background information and general data only; that hereafter your committee will hold hearings to obtain more detailed information on specific objectives.

We endorse wholeheartedly this broad approach to such an involved subject. We who speak for the bituminous coal producing industry must, of necessity, devote extensive study to this subject before we are prepared to submit detailed recommendations concerning the proper specific steps that should be taken in research on coal, so as to promote most efficiently the national welfare. We are sure that all other segments of the coal industry will agree that we are unable to submit specific recommendations at this time.

Our difficulty is, in part, due to the rapidity with which this program has moved forward after the adoption of H. R. 400 and the delegation of the responsibility to this subcommittee to carry out its objectives. We have not had the time to devote the necessary study to develop a detailed policy on each of the numerous points that have been suggested for consideration. We will, of course, arrange to give our best thinking to this subject and in the reasonably near future will be prepared to respond to the committee's request for specific recommendations.

It is most pertinent that Government, in all branches, should recognize the importance and essentiality of the coal industry. In the words of Congressman Arends, of Illinois, spoken to the House on May 9, coal is recognized for its "acknowledged position as the most depend-

able fuel available in any emergency from the standpoint of low cost, abundant supply, and dependable performance in supplying energy requirements." Any program that is designed to increase the availability and utility of coal, including research and its attendant functions, is contributing to the national interest, both from the standpoint of our economic welfare and our security.

As Congressman Arends has indicated, coal is the most abundant of our fuel resources. The recoverable coal reserves on January 1, 1953—the latest available figures—according to the Geological Survey, are approximately 950 billion tons, or the equivalent of 1,279 years at the current consumption rate. No other fuel is in the position to supply such requirements over such a long period of time. In time of emergency coal has always been depended upon to supply the increased energy demands. In World War II, in the first year of the war, the supply of energy, excluding motor fuel, rose 160 million tons bituminous coal equivalent. Of this increase, bituminous coal contributed 122 million tons, or 76.3 percent, this despite the fact that bituminous coal in 1940 constituted but 55 percent of the energy supply. The same conditions prevailed in World War I and in the Korean conflict.

Looking to the future, energy experts have estimated that our total energy requirements in 1965 in tons of bituminous coal equivalent will be 1,990 million tons and in 1975, 2,530 million tons. Of this total requirement, under normal conditions, coal would be called upon to supply approximately 700 million tons in 1965 and about 900 million tons in 1975. Such calculations do not take into consideration any type of emergency, which could push the demands of our economy on coal production into the billions of tons. As an example of power demands by individual industries, in the electric power utilities it is estimated that requirements will increase from the present 5,265 trillion B. t. u.'s in 1955 to 8,800 trillion B. t. u.'s in 1956 and 12,800 trillion B. t. u.'s in 1975. Coke and coal chemicals requirements will increase from the present 2,805 trillion B. t. u.'s to 3,600 trillion B. t. u.'s in 1965 and 4,300 trillion B. t. u.'s in 1975.

These estimates reflect what our population and consumption growth will demand. Our national welfare requires that such demands be filled. Experts, in and out of Government, estimate that fuel sources other than coal, do not have the flexibility, nor the proved reserves to meet such astounding increases in energy needs. As has been proved in three major war periods, coal will be called upon to supply the surplus demand. The extent to which coal can contribute to this increased demand will depend almost entirely on the degree of technical and financial fluidity and flexibility which is maintained in the coal industry today. A major factor in deciding coal's ability to meet such demands of our national welfare and security will lie in the extent to which the coal industry is kept sound. Coal will have to be prepared to assume the greatest share of expanded energy requirements of our economy, as distinguished from having to accept the residual demand that cannot be supplied by other energy sources.

The coal industry has, for a number of years, labored in a morass of economic handicaps, which, over the past several years, have resulted in mines closed, thousands of mine workers and railroad workers being thrown out of employment, and whole communities, dependent on coal, affected adversely. Within the last few months, the general economic

level of our industry has been better, but there are still many areas, where the upturn fails to bring any substantial relief. We must not be blinded to the general welfare of our industry, as a whole, by the rather prosperous aura in which some individual companies and coal-producing areas are surrounded. Our efforts must continue to be bent toward bringing the entire industry's activities to a state, which will not only eliminate any semblance of unemployment and economic blight, but will result in a production level that will enable the industry to provide the degree of flexibility which it must maintain in order to assure the fuel requirements of an industrial program necessary for our country's welfare and security. It should be remembered that our national population growth is at a rate of 2.5 million persons annually. If such an increase is to be fueled it will require great coal-industry expansion.

The coal industry, probably better than any other, recognizes the important part which research and development will play in such a necessary expansion in coal. Nor has our recognition of the problem been merely one of mental appreciation. We have been active in this field, but unfortunately not to the desirable extent.

In gaging the coal industry's expenditures for research and comparing such outgo with the moneys that have been spent on general research by other industrial groups, we must bear in mind that the coal industry is made up of thousands of small individual units, rather than dominant groups of large corporate bodies. As a matter of fact, the largest corporate group in our industry produced less than 6 percent of total United States production in 1955, and if we were to take the total production of the first 10 leading commercial coal producers, we would account for only 21 percent of our total 1955 tonnage.

With this in mind, one can understand the handicaps which our industry faces in developing any large fund for research purposes. Most of these companies do not have a level of profit which permits them to contribute substantially to such purposes. Many companies are still unable to make any contribution.

The capitalization of the coal industry, according to the latest available Internal Revenue Bureau figures for 1952, was $1,514,632,000. That figure is extremely low. In fact, it is antiquated and inadequate because many companies are capitalized on bases which, in the face of present costs of equipment and supplies, reflect only a small share of the actual value. Recent estimates have been made that a net capital investment of about $6 per ton of existing annual capacity is required. Based on 500 million tons capacity, this would be $3 billion. Other estimates from coal authorities are to the effect that on production facilities which might be added under present conditions of labor and supplies, the cost per annual ton of capacity would more nearly approach $10. Thus, if between now and 1965 an additional capacity of 100 million tons is required, we must have an additional investment of at least $1 billion. Present level of coal-company profits will not permit accumulation of such a fund in any reasonable period of time.

Despite the obstacles in the way of a general industry approach to this problem, certain components of the industry have been carrying on limited research ventures. Through contributions to an affiliate of the National Coal Association, Bituminous Coal Research, Inc., and by expenditures of individual companies or groups of companies, in the

coal and related industries, certain definite progress has been made in developing new mining methods and machinery, more efficient commustion units, and a host of new derivatives produced from coal, as well as many other developments which will assert their value in years to come.

According to a tabluation of 1955 research expenditures, prepared in connection with a study of research projects and possibilities undertaken jointly by the Bureau of Mines and representatives of the coal industry—Bureau of Mines Information Circular No. 7754, published May 1956—the total amount spent was $17,382,400. Of this expenditure the report makes this statement:

> Although the total effort is impressive, it is not large when compared with research and development expenditures in other industries. Moreover, much of the reported work is on the development and improvement of equipment.

In that connection, I would reiterate that the coal industry as such did not have a larger contribution to research, mainly because its financial condition would not permit more. In the face of existing conditions, however, I believe that the coal producers did well. As evidence of this, I quote from the summary report on research referred to previously. The report shows that the following sources produced the funds for the $17 million plus research expenditures in 1955:

Federal Government, $4,863,000; State governments, $579,000; commercial coal producers, $2,452,000; captive coal producers, $1,206,000; equipment manufacturers, $3,220,000; other industrials, $4,954,000; and universities and unidentified, $104,000.

Parenthetically, it might be well to point out that the $17 million estimate is a minimum figure, because as the report states, "some organizations have been overlooked and eight of those contacted made no reply."

Comparative figures for other industries, all of which are much larger in capitalization, and more integrated in corporate structure, have been published by the National Science Foundation. The figures show that in 1953 for research, the petroleum industry spent $145.9 million; the textile industry, $28 million; rubber products industry, $53.6 million; and the chemical industry $361.1 million.

I personally doubt that the coal industry, even in the most affluent days we could imagine either now or in the future, could ever hope to approach the magnitude of expenditures made by the other industries just mentioned. It just isn't possible for us to get together such staggering amounts of money. Unbelievable as it may seeem, the amounts spent for research by some of the industrial groups is almost 10 times larger than the total amount of net profit made by our entire industry. For instance, our entire industry, according to the figures of the Internal Revenue Bureau for 1952, the latest available, had a net profit after taxes of only $33,481,000, whereas the chemical industry in 1953 spent $361 million for research.

But cognizant of this possible shortage of funds, and the limited extent, by comparison, in which a coal industry research program can be launched, we are hopeful that the results of this committee's study will produce a program which will go a long way toward solving, at least in part, our problem in this field.

Nobody, either in Government or out, can successfully challenge the statement that coal is today, and will continue to be for many,

many years to come, the basic source of this Nation's energy requirements. On the basis of production figures for the first 5 months, we will produce in 1956, in the neighborhood of 500 million tons of bituminous coal. Government authorities have estimated that the total energy requirements of the United States in 1965 will be about 1.9 billion tons of bituminous coal equivalent. While coal will not actually supply that entire energy load, it is safe to assume that it will contribute at least its present proportion of 30 percent. On this basis, the bituminous coal demand in 1965, just 9 years hence, will be approximately 600 million tons, an increase of about 100 million tons of production over our present rate. Should the coal industry be called upon to supply 35 percent of this load in 1965, the increase in production would have to be 200 million tons, or a total of 700 million tons, and if coal's share was increased to 40 percent, the increase would have to be 300 million tons, or 800 million tons total.

Not only would such an expansion program in the short space of one decade require developments in mining equipment, but also in methods and practices at both the production and consuming levels. These can come about only through a well-established and continuing research program.

I will not try to outline any specific research projects which should be engaged in for the betterment of the coal industry. Such a task will require much study and discussion much along the lines of the program upon which this subcommittee is embarking. It would be my hope that this series of hearings, in which we are now engaged, will be the forerunner of other hearings to be held later, when after assimilating much of this background and preliminary material, the members of the subcommittee can inquire into specific fields of research, covered by experts in the various subjects.

I am not myself a scientist or research engineer. I am only a coal-mine operator, with a very sincere and wholesome interest in research as a possible solution of some of the problems not only of the coal industry, but of our Nation.

At this point, I believe it would be well to review generally a list of the various research items that might be subject matter for more intense study by this committee at a later date. Because the points listed in the document prepared by this subcommittee, entitled "Statement of Purpose and Objectives," are so pertinent, I hope you will pardon me if I use your list as a reference. On page 3 of the statement under the subtitle "Specific Objectives" there are listed 14 classifications. I will cover each item with brief and general comment for the information of the committee members.

1. Mining. Mining research covers a very basic field. Included in this category are the development of new mining machines, improvement of existing equipment, the development of new or improved methods of coal production, and various other items of technical and mechanical importance in coal production. All of these are important if coal production is to be increased, costs of production kept at a reasonable level, and the recovery of coal in the seam increased, all with greater safety and efficiency.

2. Preparation. With the advances being made in coal combustion, particularly in high-pressure and high-temperature boilers, and with increased conversion efficiency, the preparation of coal is more and more important. The coal industry has moved from a production

of coal in large sizes to the finer coals for the greatest part of its output. Even domestic users, with home stokers, and so forth, are now predominantly users of small-sized coals. Today with the improvement in coal-cleaning methods the process of preparing coal is, in fact, a manufacturing process, wherein a fuel can be produced which will be of any size and quality that a customer might desire. All of this is for the ultimate good of the user in that he obtains an ever-improving product at a continuing reasonable cost.

3. Handling. Coal handling is a necessary part of the movement of coal from mine to user. Degradation of coal in the process is a serious matter to many. In the cases of some coals, which are softer in structure, this can result in economic losses, especially where long hauls or frequent rehandling is required. There is opportunity for much research in the structure of coals, prevention of degradation, and sizing of coals which will result in the greatest efficiency and least loss.

4. Marketing. The field of coal marketing is an almost virgin field for research. There are so many aspects of this subject that could be surveyed and days and days of study consumed. Analysis of the basic coal markets of the United States and the world are essential to the economical and efficient serving of coal customers. Not since 1946, in the days of the Bituminous Coal Commission, has there been even any statistical data on coal markets and movement of coal. A great deal could be done with research in this field.

5. Distribution. This is a rather complex subject. It can cover a number of allied fields, and some that might possibly conflict with other research endeavors. In the main, distribution covers the movement of goods from producer to consumer, thus it includes transportation. However, in our industry that phase should be treated as a separate matter. Distribution as we think of it here, is the handling of goods by various types of agents in its move from the mine to the home, factory, utility, or mill. These would include sales agents, wholesalers, jobbers, retailers, and combinations of these. The act of purveying coal is a specialized field and one very necessary for efficient and economical sales. There is definitely a field for research into methods and practices by which coal is handled in its path from our mine tipple to the customers' storage.

6. Transportation. The welfare of the coal industry is dependent on transportation economics probably more than any of our major industries. Currently coal is "tied to the rails," as a popular expression has it. Being a bulk commodity, approximately 80 percent of all the coal moved to market is in railroad cars. Therefore, coal's market position is quickly and seriously affected by any slight increase in freight rates. Because of this, the competitive position of coal in any given market can be adversely affected by delivered-price factors over which the coal industry has no control. In some sections of the country there is a growing tendency to move coal by waterways. And in another instance, a coal company is experimenting with the transportation of coal hydraulically. One of the important items of any research undertaking is in the field of cost reduction. Certainly with the high percentage of ultimate costs represented by transportation expenses, few other research subjects could be so worth while.

7. Conventional uses. The commonplace use of coal as energy source is today its most important function. In days to come, the chemical

derivatives may predominate, but today we give our major attention to coal as a fuel. Therefore, research in improved manners of utilizing coal in the home or industrial and powerplants should have attention. Steelmaking is another important function of coal. Approximately 1 ton of coal is required to produce a ton of steel. In our growing economy, steel continues to hold an important role. At any time when our economy is diverted from peacetime to war, steel becomes indispensable. Therefore, any developments which increase the quality of steel, reduce the cost, or increase the amount of steel that can be produced, are distinct contributions to our national welfare.

8. Combustion. Combustion is the basic physical action required to turn coal from a mineral to a power-heat generating substance. The better combustion we can obtain from coal, the more economical will be coal's uses. Furthermore, more complete combustion produces a more economical utilization and less pollutants in the atmosphere. Today one of the great problems of large quantity coal users is elimination of stack gases. These are systems now devised which can be improved upon to provide more complete and more economical elimination.

9. Hydrogenation processes.

10. Carbonization processes.

11. Gasification processes (above and below ground).

12. Oils and tars from coal.

13. Coal chemicals.

These next five items must be considered collectively because these processes all yield liquid and gaseous products from coal, although in different amounts. In hydrogenation, the coal is reacted with hydrogen to produce materials that may be used as liquid fuels or as chemical raw materials. Virtually no char remains.

We have two major types of carbonization processes, high temperature and low temperature. Here heat is used to carbonize the coal, driving off the volatiles and leaving a coke or a char suitable for combustion, gasification, or coke blends. Current experiments on low-temperature carbonization are now being conducted in Texas, North Dakota, Alabama, Pennsylvania, and by the Bureau of Mines. In both processes, devolatized solids, tars, oils, and gas are produced.

In underground gasification, the coal is partly burned without being mined, and the gases are collected and either burned to generate electricity or converted to other products. An experiment in this type of coal utilization is now being conducted at Gorgas, Ala. There is still much to be done in development on these processes.

Currently one of the main concerns of the gas industry is a substitute for natural gas when our domestic reserves are eventually exhausted. We, of course, have had in the past manufactured gas, made from coal in byproduct coke ovens or is so closely allied that in the hydrogenation, carbonization, and gasification processes they are difficult to separate. For example, the Union Carbide & Carbon Corp. at a plant near Charleston, W. Va., is today producing chemicals from coal on a limited scale by hydrogenation. Reports from the operations are meager, but some chemicals are already being offered on the market. This is certainly a new field to which much research time and talent could be devoted.

14. Miscellaneous coal processes and products. There is little of an informative nature that could be said on this topic. It will cover

all those miscellaneous items that will be brought about through research in other fields, and from the advance thinking of some of our best technical and engineering brains.

As a small coal operator myself, I am greatly interested in the observation made in the committee document on page 3, and I quote:

> **The subcommittee notes that the smaller and independent coal companies are those hardest hit by the drastic drop in the demand for coal and by other factors contributing to the unstable condition of the coal-mining industry. Consequently, the subcommittee is anxious to learn of any means within the reach of small enterprises, including promising processes requiring low capital investments, by which this segment of the industry may be strengthened and remain in business.**

I am sure that all segments of the coal industry will subscribe to such an ambition. Certainly, the development of any process or device which will assist the small operation will also benefit the other operations, large and intermediate. As has been previously mentioned, our industry is predominantly small operations; because of this we have not been able to afford the type or volume of research that is necessary to produce the results expressed in the subcommittee's statement I just quoted. That is one of the reasons that we are all so encouraged by undertaking of this subcommittee seeking to find some ways and means of accomplishing that purpose.

It is not my purpose or intent in this presentation to tell you in what specific fields of research your study should be concentrated. Nor am I in a position at this time to try to suggest how much money should be spent on coal-research projects. Furthermore, it should be recognized that there are various types of research. Also, different research groups will be better able to carry out one type of project as against a project of a different type. For instance, the Federal Government, through the Bureau of Mines, and other similar agencies, could undoubtedly do one type of research, whereas another type of program could better be done by a State government, through one of its educational or technical institutions, or by private research organizations, or even by an individual company or group of companies.

I am sure that if this committee should ask each and every person in this room to evaluate a list of research projects as to their importance to the coal industry, you would get as many different opinions as there are people interviewed. The selectiton of research projects should be done on the basis of the greatest contribution to the good of the greatest number within the industry, ever keeping in mind that the public interest is paramount to that of any industry or company. Likewise, it should be emphasized that any unified research program should in no way interfere with currently operated projects, nor should there be any lessening of the individual initiative in any research undertaking. But, there should be a coordination of the various groups so as to integrate the individual actions to bring them all into focus on a singleness of purpose and ultimate accomplishment of that purpose.

At the present time, the bituminous coal industry does not espouse any single policy so far as coal research is concerned. We would suggest, however, that participation in an overall program by Federal and State governments, private industry and labor, and educational and scientific groups is absolutely essential to the success of such an undertaking. It has been very aptly stated that the primary cause of most failures in research is the lack of adeqaute finances, and

insufficient qualified manpower. It will require the full contribution of each and every group in direct proportion to their abilities, if a coal research program is to be successful.

It is our belief that this committee should, in addition to its consideration of the broad aspect of coal research, also give some thought to the implementation of such program or programs as may be brought forth. To this end, we would suggest, in view of the diversified interests involved in a coal research program, including as it must, interests within and without Government, that you consider the possibility of new legislation or amending existing legislation, to provide for an agency with adequate industry representation to handle coal research. Such a commission or agency would be coordinating in nature, with power to solicit advisory help from all research branches, be granted funds which in turn could be distributed to participating research operational units on a grant-in-aid, or loan basis, matching funds from other sources—State governments or individuals, et cetera, and in all other manners directing the research program to the best interests of the public, and the industries concerned. The agency in itself would not necessarily have to carry on any actual research projects, but could in addition to its grant and loan operations, also enter into contracts with outside agencies for the conduct of research programs. Such agency should have a continuing active interest in the research program for coal. It might be well to give some thought to the possibility that Congress, either through this or some other committee, require periodic progress reports from such an agency.

At this point, I should like to call attention to a formal action taken by State governors on this subject.

Incidentally, I know it is in the press this morning that Governor Leader, of Pennsylvania, has already stepped out and signed a bill making appropriation and setting up a commisison in Pennsylvania to carry on this work.

The Western Governors' Mineral Policies Conference, which was called by Gov. Goodwin Knight, of California, on November 7 and 8, 1955, and the Western Governors' Mining Advisory Council at subsequent meetings, adopted a series of resolutions calling for the development of a national minerals policy. The statement on the subject of research, is as follows:

RESEARCH

The council recommends to the governors serious consideration of the following discussed facts and conditions affecting industry research.

Research is the very foundation upon which the growth of the mineral industries must depend. For the future health of the mineral industries and of the entire national economy, there should be a vigorous research activity supported directly by private industry as well as by State and Federal agencies, each working in the sphere for which it is best fitted; and

With respect to privately supported industrial research, economic factors should be such as to give maximum encouragement to industrial expenditures for research. This viewpoint is embodied in a recommendation on taxes, shared in by the research committee; and

Since many research projects involve financial commitments over a long period of years, the lack of a clearly stated national mineral policy, has limited industry's willingness to undertake long-term projects. It follows that the adoption of such a national policy, to which all these recommendations are devoted will do much to encourage industrial research.

With respect to State and Federal research, the council recommends the following:

1. Establish at Federal level, and at State level where desirable, permanent minerals research advisory boards. These boards should consider and recommend initiation of research programs, which, in their opinion, are particularly needed.

2. Encourage Federal and State mineral research programs at appropriate State agencies, universities, and nonprofit research foundations.

3. Expand or establish in each of the mining States a clearinghouse or library of pertnient technical information and records dealing with all phases of the mineral industries.

The mineral industries of many of the Western States, particularly the small-mine operators, need some form of central clearinghouse for pertinent technical information which would be readily available in suitable form.

4. Continue support of existing long-range research in Federal and State agencies.

Geological and topographic mapping should be accelerated as an essential part of this long-range program.

That concludes the council recommendation on research, but the recommendation referred to under taxes was as follows:

5. As to research expenditures:

The allowance, under present law, as a deduction of expenditures on research and experimentation should be preserved.

Our thinking on the need for a suitable agency to coordinate coal research was crystallized before our attention was called to the action of the Western Governors' Council, but I can assure you that in general we are both thinking along the same lines and toward the same ultimate goal.

There is a field, which is usually overlooked when we speak of research. To most, research encompasses only technical research. However, one aspect of the coal industry is most important, and should have attention. It is marketing and distribution of coal. When this committee finally considers the various specific fields in which research activities might enter, we would sincerely urge that attention be given to the marketing and distribution of coal.

Before I close, I would like to call the committee's attention to a rather interesting statement which is contained in volume 2 of a report by the Joint Committee on Atomic Energy, published in January 1956 and entitled "Background Material for the Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy." On page 76 of this report as part of a statement submitted by the Department of Interior, appears section II, titled "Research and Development." This report after pointing out that the coal industry expenditures for research amounted to about 0.4 percent of the gross industry revenues, contains subsection (a), "Expected significant technologic developments." This says:

Significant developments are expected in all phases of the coal economy, including mining, transportation, improvement in present utilization, and in new or expanded uses. They may be listed as follows:

In mining:

(*a*) Increased mechanization of underground mining activities, as by continuous mining machines and in those mining systems in which the whole seam is taken out and no pillars left, excepting the shaft pillars and sometimes the main road pillars.

(*b*) Improved earth-moving machinery that will render strip-mining operations more economical and permit the mining of coal lying under deeper cover. Strip mining is a system of mining a seam by removing the overburden of earth to expose the coal, which is then mined by conventional earth-moving methods.

(c) Improved methods of mining coal from the outcrops without requiring underground operations, as by working a coal seam by drilling into it from the outcrops with power-driven augers of large diameter.

In transportation:

(a) Hydraulic transport, in which the coal is pumped with water through a pipeline.

(b) Transport of coal on long conveyor belts.

(c) Location of consuming plants on river and coastal barge routes.

(d) Reductions in rail costs through mechanized handling.

In utilization:

(a) Improvements in thermal efficiency of coal-fired boilers. Electrical generating plants at present consume about 1 pound of coal per kilowatt-hour. This is expected to be reduced by at least 0.05 pound per kilowatt-hour for each 5-year period.

(b) Combustion and electric-power generation at mines.

Direct conversion of coal into electricity is a possible interesting development but one that will not come into fruition until beyond the period under discussion.

In new and expanded uses:

(a) Expansion in the use of coal for chemicals manufacture.

(b) Conversion to synthetic liquid fuels.

(c) Gasification.

Then on page 80 of the report under a subsection titled "Consensus on Actions Which Could and Should Be Taken To Ameliorate the Impact on the Coal Industry," there appears this statement:

The impact is not expected to be severe in the sense that less coal will be needed than at present. On the contrary, there will be a net increase in coal requirements, even though this increase will be at a reduced rate. The increase could be large, to the extent that coal may be used for more synthetic chemicals and for synthetic fuels. The increase would be hastened if the present low level of research in the industries based on coal (0.4 percent of estimated gross income) were raised to at least the national industrial average (1½ percent). The increase in expenditures would be from about $16 million a year to $60 million a year.

In closing I would like to assure this committee that I, as spokesman for the NCA Research and Development Committee, and representing the bituminous coal industry, again want to compliment this body for its attention to the coal industry's needs in the interest of our national welfare. We are wholeheartedly in support of your undertaking. Not only do we want to give you all the moral support that is possible, but I now offer you the help and assistance, either in an advisory or manual capacity, of the facilities of not only National Coal Association, but of our committee, and individual companies to the end that your undertaking may be fruitful.

Thank you gentlemen.

Mr. EDMONDSON. Thank you, Mr. LaViers. I might, at this point, say thank you to you for the assistance and cooperation which you have already supplied to the chairman and to Mr. Soule of the staff, in connection with this undertaking. And both you and our distinguished former colleagues, the Honorable Tom Picket and the Honorable Carter Manasco, have been helpful to us.

Mr. LAVIERS. Thank you, Mr. Chairman.

Mr. EDMONDSON. We have about 7 minutes for questioning before recess for the purpose of a photograph of the full subcommittee. This is the first opportunity we have had in the last few weeks to get the full subcommittee together.

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Mr. ASPINALL. I wish to compliment Mr. LaViers on a very conclusive and interesting statement. I think it is well to have the statement:

This is a process which has been a project conducted by the Bureau of Mines in its recently closed plant at Rifle, Colo. Here coal is liquefied and used to produce a synthetic similar to crude oil.

Mr. LAVIERS. That is Louisiana, Mo . That Rifle plant was the oil shale producing activities there. I would like to have that correction made. That was at Louisiana, Mo. Those two projects were carried on more or less concurrently.

Mr. ASPINALL. There were 3 projects, 1 in Alabama, 1 in Missouri, and 1 in Colorado. They were closed before any answers were found after an expenditure of $80 million. You are not in favor of that kind of research program?

Mr. LAVIERS. No, sir; I am not. That is what we want to try to avoid, sir, by a commission that would study the possibilities and the direction of this research activity, so that we do not have that kind of thing happen again.

Mr. ASPINALL. You were present in the room this morning?

Mr. LAVIERS. No, I was not.

Mr. ASPINALL. The representatives of the Department, this morning, stated their policy something like this: They were in favor of a partnership program between industry and Government. They thought that the Government should confine its program largely to test tubes and once in a while small pilot research operations and anything larger than that, such as demonstration plants, like the three programs which we have just recently had called to our attention, should be left in the hands of industry as such. Would you go along with that?

Mr. LAVIERS. I think that might be one way to handle it. I would hope that that would be a determination of a commission or a committee that you all will evolve out of these hearings so that these various activities can be allocated to the agency which is best equipped to carry on that activity. Now, I think it is true that industry could probably take on these—well, demonstration plants, I think is the correct definition of them, rather than pilot plants. The demonstration units are in between the pilot plants and the commercial operation or full-scale operation.

Mr. ASPINALL. The demonstration plant should be at least on the order of commercial plants.

Mr. LAVIERS. That is correct, sir. That is my view. I share that view with you.

Mr. ASPINALL. Now, if you follow through with that, making reference to the amount of money which the coal industry has had up to the present time for research work, how far would the coal industry get with any demonstration plant?

Mr. LAVIERS. We would not get very far.

Mr. ASPINALL. You would not get started, would you?

Mr. LAVIERS. No, sir; we would not. We are going to need some help.

Mr. ASPINALL. On anything that will be offered in hydrogenation and gasification demonstration plants, the industry has to be in better shape than it is at the present time, or else, if it is going to be done, the Government will have to take over.

Mr. LAVIERS. I think that is correct. With the present profits of the coal industry we have no money available for any such activity as that. I would hope that that type of plan might be carried on by the chemical industry which seems to have an abundance of funds.

Mr. ASPINALL. What you are saying is that closely akin to coal mining, to the coal industry research program, is that chemical industry research program.

Mr. LAVIERS. That is one of our great hopes of the future.

Mr. ASPINALL. And rather than let the coal industry carry the ball, you would rather have the chemical industry take over that part of it?

Mr. LAVIERS. To such an extent that they have funds that they can use.

Mr. ASPINALL. That is because they are closer to what would be called by some people a monopoly of the industry.

Mr. LAVIERS. That may be correct.

Mr. ASPINALL. You made a statement, and I think it is in agreement with the statement made by the representatives of the Department this morning, that the coal industry has taken a turn for the better. To what do you attribute that?

Mr. LAVIERS. To several things, sir. One of them is the increased export of coal abroad to foreign countries and some increase to Canada, too. Another one, the increased steel production which utilizes a large amount of coal, as I say, is a big factor in the consumption of coal. The reduction in the volume of residual oil imports is another, and the increased burden by the public utilities, whose energy requirements, as you know, are steadily increasing and who, in spite of the fact that they have by scientific development been able to reduce the number of pounds of coal per kilowatt, the demand for kilowatts has increased to much faster that their consumption of coal has increased enormously. Those factors, in my opinion, account for the apparent increased prosperity in the coal industry. I cannot fail to say that I think many of these financial stories coming out of New York do not fit with the facts in eastern Kentucky, as I know them.

Mr. ASPINALL. Nor in Colorado, nor in West Virginia.

Mr. LAVIERS. They do not match them there, either.

Mr. ASPINALL. You do not think there is any possible chance that the upturn could be so dominant that you would not need any such research?

Mr. LAVIERS. I do not think so. I am interested in this from another standpoint. That is, if I can in a limited way see the future energy requirements of this country, we are going to have to develop, through research and development programs, means of making available larger supplies of energy than most of us realize at the present time.

I think Cal Tech recently put out an article in which they estimate, or attempt to estimate, some of the energy requirement. They emphasize the fact that we are going to have to use lower grade copper, lower grade iron ore, lower grade of a lot of our raw materials, and in the beneficiation of our raw materials it is going to be necessary to provide energy to put it in commercial value. That is going to require more energy than we can conceive. My interest in research is getting ready to do that.

Mr. ASPINALL. You and I know that our competitors in this field are also aware of this situation and they are trying to firm up their programs to provide the energy that is going to be needed.

Mr. LAVIERS. Yes, indeed; but they do not have the opportunity we have in the coal industry, sir.

Mr. ASPINALL. I am not going to argue that point with you today, but some of them seem to think they have.

Mr. EDMONDSON. Does the gentleman from Pennsylvania have any questions?

Mr. SAYLOR. I have no questions.

Mr. EDMONDSON. The subcommittee will stand in recess for one moment. I note the presence here of our good friend and colleague from the State of Tennessee, Congressman Baker, who is sitting through the hearings this afternoon. We are pleased to have you with us. We are planning to hear the Members of Congress on the 6th. We will be glad to hear your statement at the present time.

Mr. BAKER. Thank you, Mr. Chairman.

Mr. EDMONDSON. The subcommittee will stand in recess for about 5 minutes.

(Whereupon a short recess was had.)

Mr. EDMONDSON. The subcommittee will resume. We have about two more questions of you, Mr. LaViers, and then we will excuse you and get our Department witnesses.

Mr. SAYLOR. Mr. Chairman, I certainly hope we are going to have Mr. LaViers back because I have a great deal more than two questions to ask.

Mr. LAVIERS. Any time, Congressman.

Mr. SAYLOR. Mr. LaViers, how much overlapping do you think exists at the present time in the research that is being done and which you have designated on page 5 of your statement?

Mr. LAVIERS. At the bottom of the page? You mean in connection with these listings that I have made there?

Mr. SAYLOR. Yes.

Mr. LAVIERS. Congressman, I do not know that. I think the fact that we do not have a coordinating agency to determine that is one of the regrettable features of this whole program. I know that there are overlapping projects being carried on. I happen to know that some of our operating companies have been carrying on some research activities in which they discovered after they had started some of them that the project had been investigated by other agencies. That is one of the deplorable things about this. With such limited funds, if we could get a central coordinating agency and have our efforts concentrated in the various fields where we are best able to work, then we will accomplish a lot more with less effort. I know there are plenty of duplications.

Mr. SAYLOR. Mr. LaViers, would you suggest that this committee consider the reestablishment of the Bituminous Coal Commission as a clearing agency for research, among other things?

Mr. LAVIERS. In my statement here I suggested that an agency of Government, whatever you want to call it, be set up to consider the possibilities of coordinating the various efforts; to which funds would be allocated which they in turn could allocate to the various agencies that are engaged in this activity and to which periodic reports could be made. Whether you call it Bituminous Coal Commission or

National Coal Foundation, such as the National Science Foundation, or the Atomic Energy Commission, I am not too familiar with the type of agency that functions best up here in Washington. I have found that the term "commission" implies something different than a committee. But I think a central agency of the Federal Government to guide this activity is highly desirable, almost necessary.

Mr. SAYLOR. Now, Mr. LaViers, I think you have referred in your statement to the 14 categories which the committee used in stating their overall objectives.

Mr. LAVIERS. That is right.

Mr. SAYLOR. Has the coal industry done some research in each of these categories?

Mr. LAVIERS. I would not say in each of them. For instance, in marketing, we are woefully lacking in that. I am a member of the mining development committee of Bituminous Coal Research. We have a laboratory in Huntington, W. Va., and we are trying to find a better type of equipment to produce coal at a lower cost. I am a member of BCR, and in combustion, we are trying to do something about that. In the way of transportation, I serve on a freight rate committee and we have been very active in trying to do something about the freight rates, not very successful at times, but we do try to tell the story, that what we are interested in is the ultimate cost of the B. t. u. to the consumer. In combustion, at Columbus, Ohio, BCR has a laboratory in which we are trying to get definite package units that will get greater efficiency out of the combustion of coal and more steam for a small industrial plant. There are other items. For instance, coal chemicals. I know of no coal company that has engaged in any activity along that line. The chemical companies have done a good deal of work along that line.

Mr. SAYLOR. Then let me interrupt you to ask you this question, along with your thinking: On which of these 14 units, do you feel, should research be conducted by the Government, which do you feel should be conducted by the industry, either the coal industry, the chemical industry, or allied industry, and which of those do you feel could be a partnership proposition?

Mr. LAVIERS. Mr. Congressman, the committee of which I am chairman, and for which I am speaking, is a newly appointed committee. We have had an informal committee which has been studying and working on these phases of research and we have some tentative plans, but the formal committee has not had an opportunity to meet and adopt a program. I would not want, speaking for them, to attempt to evaluate the projects. However, we hope and we expect that the committee will have meetings and we will give this matter consideration and we will come up with a recommendation. As I say in this statement, I hope I will have an opportunity to present this recommendation to your committee at a subsequent date. It may not be the best one, the right one, but it will be our best thinking on the matter and we hope to have an opportunity to present that to you.

Mr. SAYLOR. In other words, I will not press you any further for an answer, until your committee has had a chance to get together, but I know that speaking personally, and I know for the other members of the committee, we will be interested in the conclusion which your organization will come to.

Mr. LaViers. We will be glad to present them to you at a later date.

Mr. Saylor. Besides the railroads, speaking of the transportation phase of it, what other facilities or units do you think we should call in when we discuss transportation?

Mr. LaViers. Of course, there is the waterborne transportation that is an ever-increasing factor in transportation. There is a company that is engaged in building a coal pipeline. There are other companies that have utilized conveyors for transportation of coal.

There is one other that I have not covered in this statement that I possibly should have, under the category of transportation. That is electricity. Actually, we are taking coal by wire from the generating plant to the consumer as though we shipped the coal to the consumer and converted it into electricity there. Recently one of the larger utility companies has located a plant in the heart of a coalfield where there is not adequate water resource and which, as I understand, will be one of the largest generating units utilizing cooling towers for their steam generation. Here they use the water over and over again, and they have done that because the transportation cost of coal has become so great that it is more economical for them to move their generating plant to the mine mouth and generate electricity and transport it, if you please, over high-tension wires to the consuming areas. That phase should be looked into. I think that phase you might consider as transportation of coal.

Mr. Saylor. Thank you, Mr. LaViers.

Mr. Edmondson. I might say, Mr. LaViers, for the entire subcommittee, that we will welcome your formal recommendations with regard to each of these 14 fields. I agree with the gentleman from Pennsylvania that your specific recommendations on each of those different areas will be much appreciated.

Mr. LaViers. Thank you, Mr. Chairman. We will endeavor to do that. There are several members of this committee, and if you are familiar with coal people, you know it is a little hard to get them to agree on those things, but we will try to come up with a program.

Mr. Edmondson. We thank you for the information you have given us and we look forward to a much more specific contribution.

Mr. LaViers. Thank you.

Mr. Edmondson. At this point I would like unanimous consent that the two publications presented to the committee thus far, the publication, "Bureau of Mines Information Circular 7754," and "Geological Survey Circular 293," both be made a part of the file.

Without objection, then, it is so ordered.

(The documents referred to will be found in the files of the committee.)

Mr. Miller. Mr. Chairman, I am Thomas Miller, Acting Director of the Bureau of Mines. We have two divisions in the field, the Division of Anthracite Coal and the Division of Bituminous Coal. We have representatives from each of those divisions this afternoon. They each would like to describe for the committee the research work now being done by the Bureau.

Mr. Edmondson. Suppose you present them in the order you would like to have them.

Mr. Miller. With your permission, we will present Mr. Corgan, the Chief of the Division of Anthracite Coal, and he will present their activities for you.

STATEMENT OF JOSEPH A. CORGAN, CHIEF, DIVISION OF ANTHRACITE, BUREAU OF MINES

Mr. CORGAN. Mr. Chairman, I have a prepared statement. I would like to enter the complete statement in the record. I believe if you would also allow me to paraphrase the statement as I go along I can indicate the pertinent points.

Mr. EDMONDSON. That will be helpful. The statement of Mr. Corgan will be made a part of the record at this point, together with the attached tables.

Mr. CORGAN. That is right.

(The documents referred to are as follows:)

STATEMENT BY JOSEPH A. CORGAN, OF UNITED STATES BUREAU OF MINES, DEPARTMENT OF THE INTERIOR, ON ANTHRACITE ACTIVITIES, RE HOUSE RESOLUTION 400

Pennsylvania anthracite is one of the purest natural carbons known, containing about 86 percent fixed carbon on a dry basis. Anthracite does not coke, is low in volatile content and sulfur, and under proper conditions, burns with a short, blue flame and no smoke. As it is not subject to spontaneous combustion, it may be stored in the open for long periods without serious weathering or loss of heat value. These desirable qualities and a favorable geographical location made anthracite for generations the prime space-heating fuel in the New England and Middle Atlantic States. (See table 1.) The larger sizes such as stove, chestnut, pea, and buckwheat No. 1, are used widely for home heating; rice and barley are burned by industrial users, schools, hotels, apartment houses, etc. The sizes smaller than barley are used by industry in the generation of electricity, sintering iron ore, manufacturing of briquets and coke, and for a wide variety of other purposes. At one time, the larger space-heating sizes accounted for the great bulk of the output but today the market is about evenly divided between the larger and smaller sizes due to the serious inroads made in the space-heating market by petroleum and natural gas.

The anthracite industry contributed heavily to the early industrial development of our country. The first inland waterway system in the United States was constructed to transport it to market. After the Civil War period, anthracite provided the fuel and an important part of the freight revenue necessary to construct the intricate network of railroads in the Middle Atlantic and New England areas.

Throughout the long history of the Pennsylvania anthracite industry more than 5 billion tons have been mined; yet, the original deposits were so immense, current reserves are estimated to be sufficient to support an annual production of 30 million tons for more than 300 years. The deposits underlie a surface area of about 484 square miles in 10 counties in the northeastern part of the State. At one time or another, each has reported production. In 1954, however, only 6 of these counties, Carbon, Columbia, Lackawanna, Luzerne, Northumberland, and Schuylkill produced 97 percent of the 29-million-ton output and of these 6, Luzerne and Schuylkill counties alone produced 66 percent. It is not surprising, therefore, that the general economy of such a small area would be particularly sensitive to fluctuations in the demand for a mineral product having an annual f. o. b. mine value in the hundreds of millions of dollars.

The first record of anthracite production was for the period 1807–20, during which a total of 12,000 tons was mined. Thereafter, the general trend was upward until 1917, when the record of approximately 100 million tons was reached. Peak employment occurred in 1914, when almost 180,000 men were employed at the mines. After 1917, the production curve turned downward and, except for isolated instances in which production recovered, such as in years following strikes, did not show any period of sustained increase until World War II. Production increased from 46 million tons in 1938 to 51 million in 1940; and, from 1941 through 1948, ranged between 54 million and 64 million tons per year. A severe break occurred in 1949 when total production fell to slightly less than 43 million tons and by 1954 output totaled only 29 million tons. Production in 1955 is estimated at 26 to 27 million. (See table 2.) While production declines have not always been reflected in immediate or proportionate drops

in employment because of such variables as the productivity rate, number of days worked, etc., it is true, nevertheless, that total employment in the industry has declined far more drastically than production because of a slow overall improvement in the output per man-day.

Anthracite frequently has been referred to as the area's biggest asset and most serious problem. Certainly the large reserves are of great value, not only to the producing region but to the State and the Nation. The many complex economic and social problems engendered by declines in anthracite production and the decline in employment have been of acute concern for several decades to local, State, and Federal agencies. In the past quarter century or more, several investigations and reports have been made on conditions in the anthracite region. Without going into great detail, the consensus appears to be that, as the anthracite industry provided the base of the regional economy for so long, the disturbed economic condition of the region was attributable in a large measure to the decline of that industry. Another important contributory factor is that, as layoffs occurred in the mining industry, the former mine workers were only partly absorbed by new industries locating in the region. Manufacturing has gradually displaced mining as the largest regional employer but affords employment to large numbers of women. For instance, in the general manufacturing category and in textiles, female workers outnumber males, while the ratio of females to males exceeds 6 to 1 in the apparel trades. Thus, as cutbacks occurred in the mining force, jobless male mine workers found little local opportunity for employment.

Between 1940 and 1950, the last two general census years, large numbers left the anthracite region to seek employment elsewhere. Despite an increase of 14.5 percent in the population of the United States between 1940 and 1950, the population of the 6 largest anthracite-producing counties declined 11 percent during the same decade. The number of unemployed dropped from approximately 113,600 in 1940 to 29,300 in 1950. However, as the net decline in population was approximately 133,000, it appears that the sharp fall in the unemployment total was due almost entirely to outmigration rather than to the creation of new jobs.

According to data released periodically by the Pennsylvania State Employment Service, at mid-March 1956, 18,050 (12.6 percent of the civilian labor force) were unemployed in the Wilkes-Barre-Hazleton area; 14,850 (17.8 percent of the labor force) in Schuylkill County; and 12,050 (11.8 percent) in the Scranton area. These reports indicate also that, as in the past, males are predominant in the ranks of the unemployed and there is a continuing decline in the population. The conditions outlined, of course, have had a demoralizing effect upon the stability of banking, retail sales, taxes, railroad revenue, and employment, and have imposed a serious burden upon the State in connection with unemployment compensation payments.

Solutions to the economic problems of the anthracite region may be found through two channels. First, a well-conceived aggressive campaign to attract new industries, preferably those in the heavy-industry category, to provide employment for a larger percentage of male workers. Second, revitalization of the anthracite industry through a research program designed to lower production costs and develop new uses for the product. In recent years, many local groups have been organized to induce new industries to move into the region. Some success already has been attained; but, the results achieved to date have, according to the facts available, been more effective in softening the blow than in effecting a permanent cure.

In 1942, an act of Congress authorized the establishment of a research laboratory at Schuylkill Haven, Pa. Funds were not immediately available, however, and the laboratory was not constructed until 1950. The laboratory was planned to serve as a center of information on problems pertaining to the conservation of anthracite reserves; efficient mining, preparation, and utilization practices; the development of new uses; the promotion of safety, health, and sanitation in anthracite mining operation; and the study of special problems assigned to the Bureau. Various anthracite research projects have been carried out by the Bureau through the laboratory.

The Bureau of Mines and an anthracite-producing company cooperated in underground experiments on timbering methods and strata control, in which there has been little change in the past 75 years. However, only relatively meager data were available, therefore, the first phase was devoted to investigating pneumatic rock packing, which was first carried out in Germany in 1924 and has since been used at mines in Great Britain. Subsequently, experiments were conducted

using an imported German pneumatic packing machine, furnished by the Bureau, in an anthracite mine at Plymouth, Pa. Preliminary tests of the packing machine were promising enough to prompt the cooperating company to try it in another area at the same colliery, where first mining has been completed and it was planned to mine the remaining coal pillars. In this section of the mine the roof is weak, making pillar recovery difficult and dangerous using the conventional mining methods wherein wooden timbers are used as roof supports. It was concluded that backfilling should make it possible to recover pillar coal that otherwise would have to be left in place to support the surface improvements and water-bearing sand and gravel that overlie the coal in this area. As a large part of the future anthracite production from the northern anthracite field will be obtained from pillars left after first-mining, backfilling may assure great importance in preventing breaking and caving of the overlying strata while this coal is being recovered.

Preliminary experiments with Bureau-owned Becorit collapsible steel props have been completed. The problem here was to develop a method insuring safe and efficient mining of thick coal pillars in flat-bed areas under water-bearing sands, and/or under thick, strong layers of overlying rock displaying a tendency to produce squeeze conditions when pillars were removed. The theory advanced, and proved by the experiment, stresses that advantages in safety, recovery, and efficiency are to be gained when the roof is permitted to subside gradually and evenly over a wide area. Apparently this type of roof action is best attainable by using yielding supports. Convergence as great as 8 inches did not affect the immediate roof. During these tests, 25,000 tons of run-of-mine coal was removed.

A vibrating-blade coal planer for mining and loading coal without drilling or blasting was designed and acquired by the Bureau. As this machine is pulled along the face the coal is sheared from the solid by four pneumatic hammers and is loaded onto a conveyor. As the availability of funds permitted, the Bureau designed, constructed, and accumulated the minimum amount of auxiliary equipment and accessories necessary for establishing two points, (1) whether anthracite could be planed and (2) the characteristics of a machine for doing so. A cooperating company prepared the underground test site. By the end of 1955, it was proved conclusively by actual tests that anthracite could be planed and the physical and geological conditions necessary for planer operation were established. Operations were discontinued because a full complement of equipment necessary for productive mining was lacking.

Although the total production of anthracite has been declining in recent years, the relative demand for buckwheat No. 4 and smaller sizes has increased. This increased demand for finer sizes has created new problems in sizing and screening. The low dollar value of fine coal required that preparation practices be conducted with maximum economy and efficiency. To that end, the Bureau completed a study on the commercial application of the launder screen. The study showed that the launder screen could be used efficiently and economically in preparing the feed to, and the products from, all types of anthracite fine coal cleaning equipment.

Anthracite crushing practices historically have been predicated on maximum production of the larger sizes (egg, stove, and chestnut) by using spiked, double-roll crushers. However, in view of the relatively stronger demand for fine coal, the industry requested the Bureau to undertake a study of all size-reduction methods to determine which would yield a maximum of buckwheat and rice sizes when crushing larger size coals. A number of non-roll-type crushers were studied, including impact, jaw, ring, and gyratory types. Of these, the gyratory type appears to be the most efficient in recovering maximum quantities of the desired sizes.

Also, at the request of the anthracite industry, a technical and economic study was made on the use of anthracite in portable heaters for controlling frost damage and in portable crop driers. A report has been published on this study which indicates that, under severe weather conditions, as much as 250,000 tons might be marketed annually for these purposes.

Various uses of anthracite by the metallurgical industries have been investigated in a search for data leading to the development of new markets, or the expansion of present markets. The practice of admixing small quantities of anthracite fines with coking coals, which was undertaken on a commercial scale as early as 1941, has grown to the extent that more than 200,000 tons are charged to coke ovens annually. Some advantages realized are improved size uniformity, with no material change, or even some improvement, in coke strength,

and a somewhat greater flexibility in coal selection at coke-oven plants, as anthrafines can be used to reduce the expansion of coking coals. Other factors involved in the blending of anthrafines to produce metallurgical coke have been studied by the Bureau and results of the investigation are being prepared for publication.

In two series of tests made in the Bureau's experimental blast furnace, anthracite was substituted for coke for up to 40 percent of the fuel load with Mesabi ore and for up to 60 percent with prepared ores. When smelting pellets, the use of anthracite for part of the fuel resulted in lower fuel consumption, about 1,450 pounds per ton of metal, and higher production rates at constant blowing rate. Sulfur content of thet metal was somewhat lower when anthracite was used, even though the anthracite analyzed slightly higher in sulfur than the coke it replaced. Tests in a large furnace would be necessary to determine the suitability of anthracite in a commercial blast furnace.

Experimental work is being carried on at present time on the production of an extruded, agglomerated metallurgical fuel. The primary purpose of this work is to ascertain what is the highest quality agglomerated anthracite fuel that can be produced. The work requires a thorough investigation of the most favorable conditions for calcining (temperature and duration) in relation to the properties of the various anthracites. When this has been determined the product will be throughly tested in commercial size equipment. The latter will be done in cooperation with industry. Lump anthracite is also being calcined in a pilot-plant calcining furnace and will also be tested in commercial equipment.

Cooperative tests were made in a metallurgical blast cupola used to produce pig iron and molten metal from mild steel scrap of the cheaper grades. Egg size anthracite replaced some of the coke in the fuel charge. The performance of the anthracite used in the cupola for up to 30 percent of the fuel charge was favorable. However, the data were not conclusive as sufficient time was not available in which to confirm the results.

In planning future research it may be said that an expansion of the market for anthracite can best be accomplished by the development of new uses for the product and the development of new or improved mining methods and equipment to increase the output per man per day. The fields of metallurgy and gasification appear to offer the most promise of consuming sufficiently large tonnages of anthracite to have a beneficial effect on the industry. Therefore, it is considered advisable to focus a large part of the utilization and preparation research in these areas.

The research and engineering development work planned will include the design and construction of equipment for the production of agglomerate fuel on a pilot-plant scale, and an investigation of new designs, or applications of furnaces, for metallurgical uses. Because it appears that in the future there will be a tremendous expansion in the use of synthesis gas for the production of chemicals, ammonia, liquid, and gaseous synthetic fuels, it is proposed to investigate the behavior of anthracite in gasification equipment. In view of the anthracite region's proximity to the heavily populated and highly industrialized East, it is believed that the tremendous reserves of anthracite ultimately will play an important role in supplying future requirements of synthesis gas in the area. Some work has been done on the gasification of anthracite in the past but activity in this field should be expanded. In the first investigation proposed, the use of rough-cleaned and rough-sized anthracite for making high B.t.u. gas in high-pressure fixed-bed gasification equipment will be undertaken. This work will include also a study of preparation requirements for a product that the gasification tests indicate will be economically as well as technically adaptable for the purpose.

It is imperative that coal be mined at a cost permitting the producer to sell it at the price that will not only provide him with a fair profit but which will also prove economically attractive to the consumer. The attainment of such a favorable cost level will require the development of new mining machinery and methods.

In the field of mining, it is planned to complete the research already started on the vibrating coal planer by creating a complete production system, studying the planer unit to learn the best methods of operation, and to demonstrate the value of the method to the anthracite industry. Additional research on the practicability of using Becorit yielding steel props will also be undertaken on this project. The actual mine test work will be carried out in cooperation with an anthracite producing company.

In conclusion, it may be said that the Federal Government has an important stake in the future of the Pennsylvania anthracite industry. The Government's interest lies not only in the alleviation of unemployment and other social problems created by the decline of anthracite production, but in the knowledge that, in the near future, it is expected that the demand for energy will require that all our coal resources must be readily available for use in peace and for the national defense. The Congress, with conservation in mind, passed Public Law 162 in July of 1955, to provide for the conservation of anthracite coal resources through measures of flood control and anthracite mine drainage. This legislation authorizes the Secretary of the Interior to make financial contributions to the Commonwealth of Pennsylvania on programs or projects approved by the Secretary for the control and drainage of water in the anthracite coal formations. The amounts to be authorized by the Secretary shall not exceed $8,500,000 and are to be equally matched by the Commonwealth. It is expected that the first projects in program will be submitted to the Department for approval in the near future.

On the research projects undertaken to date, the Bureau of Mines has received full cooperation from the anthracite industry and labor. Indicative of the cooperative spirit existing between the Federal and State Governments, industry, and labor, is the forthcoming anthracite conference to be held at the Pennsylvania State University in October of this year. The conference is for the purpose of discussing research which may prove of benefit to the anthracite industry and the people of the anthracite region and will be attended by representatives of each body.

TABLE 1.—*Distribution of Pennsylvania anthracite, Apr. 1, 1954, to Mar. 31, 1955, by States, Provinces, and countries of destination, in net tons*

Destinations	Pea and larger						Buckwheat No 1 and smaller					Total, all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total	Buckwheat No 1	Rice	Barley	All other sizes	Total		
United States:													
New England States:													
Connecticut	.....	3,539	119,168	136,952	12,905	272,564	25,598	17,894	20,741	1,161	65,394	337,958	1.27
Maine	.....	6,252	64,427	56,812	1,866	129,357	8,129	9,189	52	1,559	18,929	148,286	.56
Massachusetts	633	58,407	486,743	228,606	18,663	793,052	64,642	59,528	25,408	12,024	161,602	954,654	3.58
New Hampshire	.....	4,051	48,171	29,735	1,962	83,919	11,758	13,269	61,201	1,585	90,813	174,732	.66
Rhode Island	.....	2,765	51,340	33,575	2,363	90,043	8,027	6,041	.....	281	14,349	104,392	.39
Vermont	206	2,771	58,400	37,133	5,848	104,358	24,754	21,812	652	127	47,345	151,703	.57
Total	839	77,785	828,249	522,813	43,607	1,473,293	142,908	127,733	111,054	16,737	398,432	1,871,725	7.03
Middle Atlantic States:													
New Jersey	5,722	15,437	346,983	827,665	261,209	1,457,016	379,645	339,007	736,262	628,316	2,083,230	3,540,246	13.30
New York	3,129	143,263	1,445,304	1,248,584	849,919	3,690,199	1,417,842	564,906	535,877	734,773	3,253,398	6,943,597	26.08
Pennsylvania [1]	58,320	36,818	658,945	1,623,404	1,522,223	3,899,710	1,075,840	1,024,724	1,545,798	2,264,252	5,910,614	9,810,324	36.85
Total	67,171	195,518	2,451,232	3,699,653	2,633,351	9,046,925	2,873,327	1,928,637	2,817,937	3,627,341	11,247,242	20,294,167	76.23
South Atlantic States: [2]													
Delaware	2,871	1,538	31,521	88,836	5,335	130,101	5,022	3,505	16,574	.....	25,101	155,202	.58
District of Columbia	.....	3,511	24,532	36,778	4,003	68,824	18,118	1,179	708	.....	20,005	88,829	.33
Maryland	1,396	6,344	94,987	100,356	27,495	230,578	30,654	9,094	840	68,785	109,373	339,951	1.28
Virginia	.....	737	18,128	22,207	3,179	44,251	22,808	79	.....	537	23,424	67,675	.26
Total	4,267	12,130	169,168	248,177	40,012	473,754	76,602	13,857	18,122	69,322	177,903	651,657	2.45
Lake States: [3]													
Illinois	1,248	3,198	11,583	26,128	3,797	45,954	18,638	12,454	8,097	20,580	59,769	105,723	.40
Michigan	.....	3,429	46,812	27,580	1,249	79,070	5,359	7,581	.....	25,730	38,670	117,740	.44
Minnesota	.....	108	2,381	3,955	228	6,672	.....	1,203	366	18,504	20,073	26,745	.10
Ohio	.....	1,416	2,137	13,790	775	18,118	13,942	20,400	3,279	58,388	96,009	114,127	.43
Wisconsin	.....	44	67,305	102,917	8,976	179,242	8,050	4,716	.....	85,412	98,178	277,420	1.04
Total	1,248	8,195	130,218	174,370	15,025	329,056	45,989	46,354	11,742	208,614	312,699	641,755	2.41
All other States	3,385	1,350	6,193	53,225	31,204	95,357	27,694	18,658	10,104	116,919	173,375	268,732	1.01
Total, United States	76,910	294,978	3,585,060	4,698,238	2,763,199	11,418,385	3,166,520	2,135,239	2,968,959	4,038,933	12,309,651	23,728,036	89.13

Canada:													
Ontario	.....	32,365	962,141	637,562	58,452	1,690,520	57,735	59,359	2,884	2,044	122,022	1,812,542	6.81
Quebec	.....	9,815	194,221	107,612	13,436	325,084	79,384	123,676	62,196	1,321	266,577	591,661	2.22
Other Provinces	539	3,609	10,695	8,482	.....	23,325	585	953	.....	39	1,577	24,902	.10
Total Canada	539	45,789	1,167,057	753,656	71,888	2,038,929	137,704	183,988	65,080	3,404	390,176	2,429,105	9.13
Other countries	.....	9,303	31,351	143,135	106,337	290,126	56,205	29,872	.....	87,205	173,282	463,408	1.74
Grand total	77,449	350,070	4,783,468	5,595,029	2,941,424	13,747,440	3,360,429	2,349,099	3,034,039	4,129,542	12,873,109	26,620,549	100.00

[1] Includes local sales.
[2] Shipments to other States generally referred to as being in the South Atlantic area are included in "All other States."
[3] Shipments to Indiana are included in "All other States."

TABLE 2.—*Statistical trends in the Pennsylvania anthracite industry, 1925–55*

Year	Production	Value of production	Average value per net ton	Exports [1]	Imports [1]	Apparent consumption	Average number of employees	Average number of days worked	Average tons per man per day	Average tons per man per year	Quantity cut by machines	Quantity produced by stripping	Quantity loaded mechanically underground [2]
	Net tons			*Net tons*	*Net tons*	*Net tons*					*Net tons*	*Net tons*	*Net tons*
1925	61,817,149	$327,664,512	$5.30	3,179,006	382,894	64,061,000	160,312	182	2.12	386	941,189	1,578,478	
1926	84,437,452	474,164,252	5.62	4,029,683	813,956	77,221,000	165,386	244	2.09	511	931,650	2,401,356	
1927	80,095,564	420,941,726	5.26	3,325,507	119,030	74,672,000	165,259	225	2.15	485	1,171,888	2,153,156	[3] 2,223,281
1928	75,348,069	393,637,660	5.22	3,336,272	384,707	73,650,000	160,681	217	2.17	469	1,289,809	2,422,924	[3] 2,351,074
1929	73,828,195	385,642,751	5.22	3,406,369	487,172	71,457,000	151,501	225	2.16	487	1,159,910	1,911,766	3,470,158
1930	69,384,837	354,574,191	5.11	2,551,659	674,812	67,628,000	150,804	208	2.21	460	1,410,123	2,536,288	4,467,750
1931	59,645,652	296,354,586	4.97	1,778,308	637,951	58,408,000	139,431	181	2.37	428	1,587,265	3,813,237	4,384,780
1932	49,855,221	222,375,129	4.46	1,303,355	607,097	50,500,000	121,243	162	2.54	411	1,674,223	3,980,973	5,433,340
1933	49,541,344	206,718,405	4.17	1,034,562	456,252	49,600,000	104,633	182	2.60	473	1,648,249	4,932,069	6,557,267
1934	57,168,291	244,152,245	4.27	1,297,610	478,118	55,500,000	109,050	207	2.53	524	1,981,088	5,798,138	9,284,486
1935	52,158,783	210,130,565	4.03	1,608,549	571,439	51,100,000	103,269	189	2.68	505	1,848,095	5,187,072	9,279,057
1936	54,579,535	227,003,538	4.16	1,678,024	614,639	53,200,000	102,081	192	2.79	535	2,162,744	6,203,267	10,827,946
1937	51,856,433	197,598,849	3.81	1,914,173	395,737	50,400,000	99,085	189	2.77	523	1,984,512	5,696,018	10,683,837
1938	46,099,027	180,600,167	3.92	1,908,911	362,895	45,200,000	96,417	171	2.79	478	1,588,407	5,095,341	10,151,669
1939	51,487,377	187,175,324	3.64	2,590,000	298,153	49,700,000	93,138	183	3.02	553	1,881,884	5,486,479	11,773,833
1940	51,484,640	205,489,814	3.99	2,667,632	135,436	49,000,000	91,313	186	3.02	562	1,816,483	6,352,700	12,326,000
1941	[4] 56,368,267	240,275,126	4.26	3,380,189	74,669	52,700,000	88,054	203	[5] 3.04	[5] 617	1,855,422	7,316,574	13,441,987
1942	[4] 60,327,729	271,673,380	4.50	4,438,588	140,115	56,500,000	82,121	239	[5] 2.95	[5] 705	2,285,640	9,070,933	14,741,459
1943	[4] 60,643,620	306,816,018	5.06	4,138,680	166,020	57,100,000	79,153	270	[5] 2.78	[5] 751	1,624,883	8,989,387	14,745,793
1944	[4] 63,701,363	354,582,884	5.57	4,185,933	11,847	59,400,000	77,591	292	[5] 2.79	[5] 815	1,336,082	10,953,030	14,975,146
1945	[4] 54,933,909	323,944,435	5.90	3,691,247	149	51,600,000	72,842	269	[5] 2.79	[5] 751	1,210,171	10,056,325	13,927,955
1946	[4] 60,506,873	413,417,070	6.83	6,497,245	9,556	53,900,000	78,145	271	[5] 2.84	[5] 770	1,232,828	12,858,930	15,619,162
1947	[4] 57,190,009	413,019,486	7.22	8,509,995	10,350	48,200,000	78,600	259	[5] 2.78	[5] 720	1,209,983	12,603,545	16,054,011
1948	[4] 57,139,948	467,051,800	8.17	6,675,914	945	50,200,000	76,215	265	[5] 2.81	[5] 745	1,016,757	13,352,874	15,742,368
1949	[4] 42,701,724	358,008,451	8.38	4,942,670		37,700,000	75,377	195	[5] 2.87	[5] 560	557,599	10,376,808	11,858,088
1950	[4] 44,076,703	392,398,006	8.90	3,891,569	18,289	39,900,000	72,624	211	[5] 2.83	[5] 597	611,734	11,833,934	12,335,650
1951	42,669,997	405,817,963	9.51	5,955,535	26,812	37,000,000	68,995	208	2.97	618	496,085	11,135,990	10,847,787
1952	40,582,558	379,714,076	9.36	4,592,060	29,370	35,300,000	65,923	201	3.06	615	386,128	10,696,705	10,034,464
1953	30,949,152	299,139,687	9.67	2,724,270	31,443	28,000,000	57,862	163	3.28	535	318,699	8,606,482	6,838,769
1954	29,083,477	247,870,023	8.52	2,851,239	5,831	26,900,000	43,996	164	4.02	659	381,424	7,939,680	6,978,035
1955	[6] 26,367,000	[7]	[7]	3,152,347	170	[6] 23,800,000	[6] 35,000	[7]	[7]	[7]	[7]	[7]	[7]

[1] U. S. Department of Commerce.
[2] Data first collected in 1929.
[3] As reported by the Commonwealth of Pennsylvania, Department of Mines.
[4] Includes some "bootleg" coal purchased by authorized operators and prepared at their breakers.
[5] Output per man calculated on authorized tonnages only; "bootleg" purchases excluded.
[6] Estimated.
[7] Not yet available.

Mr. CORGAN. Pennsylvania anthracite is one of the purest natural carbons known, containing about 86 percent fixed carbon on a dry basis. Anthracite does not coke, is low in volatile content and sulphur. I might mention that is one of the principal differences between anthracite and bituminous coal. It is an extremely hard coal, high in carbon, and has a low volatile content. These desirable qualities and a favorable geographical location made anthracite for generations the prime space heating fuel in the New England and Middle Atlantic States. At one time the larger sizes were used exclusively for space heating purposes. Today, however, about 65 percent of the anthracite production is used for heating of homes and hotels and the like, and the remainder is used for industrial purposes. Throughout the long history of the Pennsylvania anthracite industry about 5 billion tons have been mined, yet the original deposits were so large that at the rate of approximately 30 million tons a year production, there is still sufficient coal for approximately 300 years' time. Anthracite production was first recorded in 1807, when there was approximately 12,000 net tons mined. Production increased consistently until about 1917, with an output of roughly 100 million tons. It then declined consistently since 1917, until it hit a low point prior to the war in 1938, of about 46 million tons. With the impact of the war, production came up to around 64 million tons. Then it started to decline again and in 1955 we estimated the production was around 26 or 27 million tons.

You can see from the fact that Pennsylvania anthracite is highly concentrated in northeastern Pennsylvania, in fact virtually all the production today comes from six counties, why this decline in production has hit northeastern Pennsylvania hard so far as employment is concerned. At one time, in fact up until very recently, anthracite was the principal employer of manpower in the anthracite mining towns in northeastern Pennsylvania. In the last few years manufacturing has gradually displaced anthracite. However, the manufacturing that has come into the anthracite region affords employment principally to females to the virtual exclusion of males, which results in many unemployed miners in northeastern Pennsylvania today. According to data released periodically by the Penn State Employment Service, in March 1956, there were 18,050, or 12.6 percent of the civilian labor force, unemployed in the Wilkes-Barre-Hazleton area; 14,850, or 17.8 percent of the labor force in the Schuylkill County area were unemployed, and 12,050 persons, or 11.8 percent in the Scranton area.

A solution to the economic problems of the anthracite region may be found through two channels. First, a well-conceived aggressive campaign to attract new industries, preferably those in the heavy industry category, to provide employment for a larger percentage of male workers. Second, revitalization of the anthracite industry through a research program designed to lower production costs and develop new use for the product. In recent years many local groups have been organized to induce new industries to move into the region. Some success already has been attained but the results achieved to date have, according to the facts available, been more effective in softening the blow than in deflecting a permanent cure.

In 1942 the Congress authorized the establishment of a research laboratory at Schuylkill Haven, Pa. This laboratory was built in

1950. Through the anthracite laboratory, the Bureau of Mines has cooperated in many research projects with the anthracite industry. I would like to cover just a few of the projects where we have worked with the anthracite industry in the mining field. We have experimented with the pneumatic packing machine in the anthracite region with considerable success. It was concluded from these tests that the back-filling work that was done by this machine should make it possible to recover pillar coal which otherwise would have to be left in place to support the surface improvements and water-bearing sand and gravel that overlay the coal in the area. We also did considerable experimental work with Becorit collapsible steel props. These are props that actually give with the roof as the roof starts to converge. We have done quite a lot of work with a vibrating coal planer for mining and loading coal without drilling or blasting. As this machine is pulled along the face the coal is sheared from the solid by four pneumatic hammers. As availability of the funds permitted, the Bureau designed, constructed, and accumulated the minimum amount of auxiliary equipment and accessories necessary to establish two points; whether anthracite could be planed, and (2) the characteristics of the machine for doing so. A cooperating company prepared the underground test site. By the end of 1955, it was proved conclusively by actual tests that anthracite could be planed and the physical and geological conditions necessary for planer operation were established.

I would like to make one point there. The work that we have been doing in mining research has, of course, all had one goal. That is, to increase the output per man per day. Because the output per man per day in anthracite must be increased in order for the industry to be in a better competitive position than it is at the present time.

In the field of utilization we have done considerable research in attempting to find new markets. In 2 series of tests made in the Bureau's experimental blast furnace at Pittsburgh, anthracite was substituted for coke for up to 40 percent of the fuel load with Mesabi ore and up to 60 percent with prepared ores. When smelting pellets, the use of anthracite for part of the fuel resulted in lower fuel consumption, about 1,450 pounds per ton of metal, and higher production rates at constant blowing rate. Sulfur content of the metal was somewhat lower when anthracite was used. Tests in a large furnace would be necessary to determine the suitability of anthracite in a commercial blast furnace. Experimental work is being carried on at the present time on the production of an extruded, agglomerated metallurgical fuel. The purpose of this work is to ascertain what is the highest quality of agglomerated anthracite fuel that can be produced.

The work requires a thorough investigation of the most favorable conditions for calcining anthracite in relation to the properties of the various anthracites. When this has been determined the product will be thoroughly tested in commercial-size equipment. The latter will be done in cooperation with industry. In planning future research it may be said that the expansion of the market for anthracite can be best accomplished by development of the new uses for the product and development of new or improved mining methods and equipment to increase the output per man per day. The fields of metallurgy and gasification appear to offer the most promise of consuming sufficiently large tonnages of anthracite to have a beneficial effect on the industry. Therefore, it is considered advisable to focus a

large part of the utilization and preparation research in these areas. The research and engineering development work planned will include the design and construction of equipment for the production of agglomerated fuel on a pilot plant scale, and an investigation of new designs, or application of furnaces, for metallurgical use. Because it appears in the future there will be a tremendous expansion in the use of synthetic gas for production of chemicals, ammonia, liquid and gaseous synthetic fuels, it is proposed to investigate the behavior of anthracite in gasification equipment.

It is imperative that coal be mined at a cost permitting the producer to sell it at a price that will not only provide him with a fair profit, but which will also prove economically attractive to the consumer. The attainment of such a favorable cost level will require the development of new mining machinery and methods. In the field of mining it is planned to complete the research already started on the vibrating coal planer by creating a complete production system by studying the planer unit to learn the best methods of operation and to demonstrate the value of the method to the anthracite industry. Additional research on the practicability of using Becorit yielding steel props will also be undertaken on this project. The actual mine-test work will be done in cooperation with an anthracite-producing company. On research projects undertaken to date the Bureau of Mines has received the full cooperation from the anthracite industry and labor. Indicative of this cooperative spirit existing is the forthcoming anthracite conference at the Penn State University in October, which will be attended by representatives of the Federal and State governments, industry and labor and others interested in anthracite. In conclusion, it may be said that the Federal Government has an important stake in the future of the Pennsylvania anthracite industry. The Government's interest lies not only in the alleviation of unemployment and other social problems created by the decline of anthracite production, but in the knowledge that in the near future it is expected that the demand for energy will require that all of our coal resources must be readily available for use in peace and for the national defense.

That concludes the statement, Mr. Chairman.

Mr. EDMONDSON. That is a very fine job of going through it and condensing it. We appreciate it very much.

Are there any questions?

Mr. ASPINALL. Not only a fine job of condensing it, but it is a very interesting statement. Inasmuch as Mr. Corgan has not said anything about oil shale and I know nothing about anthracite coal except having had to fill my grandfather's burner as a boy and watch it burn in Ohio, I yield to the gentleman from Pennsylvania, who is more or less involved in this.

Mr. SAYLOR. I appreciate that, Mr. Aspinall, but the coal that the gentleman is referring to is found in the counties represented by our colleagues in Pennsylvania: Mr. Flood, Mr. Fenton, and Mr. Carrigg.

I do have some questions. First, I want to congratulate you on your statement. I think that I have a few questions that might be of assistance to the committee. First, you made the statement that anthracite doesn't coke. What studies have you made, if any to determine whether you can get anthracite coal to coke?

Mr. CORGAN. We have experimented in that. It simply will not do it. In other words, anthracite has such a very low volatile content, it is around 5 percent, that we have not been able to coke it. We have been able to do this: We have calcined anthracite. We are running some experiments at the present time, in which we have improved the hardness and lowered the volatile matter. We are trying to make an anthracite briquet by calcining. In other words, we will briquet the smaller sizes of anthracite, then through calcining we hope to make a fuel which will be comparable to coke. It must be hard and tough. We have had some success in that field, but as far as actual coking goes we cannot do it.

Mr. SAYLOR. The reason I ask that is that just the other day there came to my office a gentleman who said he had a system which would produce coke from anthracite coal. I referred him to you. I do not know whether anything will come of it, but I certainly hope that if there is anything that he has which will lead you to believe that it might be practical, that in your experimental stages up there you will at least try it out.

Mr. CORGAN. We will be very much interested in knowing about it.

Mr. SAYLOR. Now, in the past, what has been the record of recovery percentagewise as far as anthracite is concerned?

Mr. CORGAN. Approximately 50 percent—you mean recovery underground?

Mr. SAYLOR. Underground recovery.

Mr. CORGAN. 50 to 60 percent. In some cases more or less. That would be average now. We do have some operations where recovery is up around 80 or 90 percent.

Mr. SAYLOR. Now, will the use of the planer which you have developed increase the percentage production?

Mr. CORGAN. We believe that the use of the planer when fully developed, in combination with the use of the Becorit steel yielding props, will increase recovery; yes, sir.

Mr. SAYLOR. Have you used, in the anthracite fields, the roof bolts which are becoming increasingly popular in the bituminous fields?

Mr. CORGAN. To a small extent. Not the way they have been used in bituminous coal.

Mr. SAYLOR. What is the reason they are not used as much?

Mr. CORGAN. I believe it is due to the geologic conditions and individual type mining with little mechanization but I think more so, in other words, compared with bituminous coal. But in the next 10 years or thereabouts with additional research it may move into anthracite on a larger scale.

Mr. SAYLOR. Will that tend to increase the overall production or recovery?

Mr. CORGAN. It could very well, sir.

Mr. SAYLOR. You state that one of the desires that your research was to develop was the increase in production per man.

Mr. CORGAN. That is right, sir.

Mr. SAYLOR. As a result of the experiments which you have been conducting in the anthracite field, will you tell the committee just what direct results that has had on the output per man?

Mr. CORGAN. Of the experiments that we have conducted?

Mr. SAYLOR. Yes.

Mr. CORGAN. In the experiments that we have conducted with the planing machine and with the Becorit props, we have definitely shown an increased output per man per day in the small areas where we have conducted this research. How it would apply on an industrywide scale would be open to debate but I might say that we have not had the time, we have not completed our work, in other words, most of our work on anthracite has to a great extent barely gotten underway. Now, I hope that within the next few years, when we are doing things on a somewhat larger scale, we will be able to answer your questions better.

Mr. SAYLOR. I want to congratulate you on the tremendous progress you have already shown. That shows what can be done by the research you are using up there. I certainly commend you for everything you have done and hope to see to it that the funds are continued so that the man-hour production can be increased. Now, I have one other question.

This conference which you say is being held in October, do you know just when that is being held?

Mr. CORGAN. It is October 18 and 19, at the Pennsylvania State University, University Park, Pa.

Mr. SAYLOR. Mr. Chairman, I would recommend heartily to you that, if at all possible, the committee arrange to attend that conference.

Mr. EDMONDSON. I think the gentleman has a constructive idea there. I think we will make arrangements to have representation there.

Mr. SAYLOR. Those are all the questions I have.

Mr. EDMONDSON. The gentleman from Colorado and I were discussing the operation of this vibrating blade coal planer. Did you have some specific questions you wanted to ask?

Mr. ASPINALL. Let me ask this first: Do you usually use powder in knocking down anthracite coal?

Mr. CORGAN. Yes, sir.

Mr. ASPINALL. That is the ordinary way, just like mining bituminous coal?

Mr. CORGAN. That is right.

Mr. ASPINALL. If you use a planer, you do not use powder, is that right?

Mr. CORGAN. I beg your pardon.

Mr. ASPINALL. If you use a planer, you do not use powder?

Mr. CORGAN. A very small amount. The planer will plane the coal to a height of approximately 2 feet; that is, the present planer will do this. In other words, as it moves along the face, it will undercut to a height of 2 feet. We cut back as far as we can. To bring down the top coal it might take a very small amount of powder or it might not take any. In other words, the top coal might come down of its own accord. Our experiments have shown so far that it takes very little force to knock the top coal down.

Mr. ASPINALL. The question was whether or not the planer is used to just take the coal off the face or whether it is used for the purpose mostly of getting the coal down.

Mr. CORGAN. It is used for both purposes. In other words, the primary cut that is made, which is 2 feet high, actually planes the coal from the face. Then the top coal, as a result, with no support under it, although generally it cannot be taken down with a pick,

may be released with a pneumatic hammer. Generally anthracite does not fall easily, but the planer may pretty well eliminate the powder that you refer to.

Mr. SAYLOR. Instead of powder, have you ever considered drilling and using charges of CO_2?

Mr. CORGAN. I did not get that, sir.

Mr. SAYLOR. Have you ever considered drilling and using charges and using charges of CO_2?

Mr. CORGAN. I know what you refer to. I think there has been some consideration given to that, but little, if any, cardox is used in anthracite.

Mr. EDMONDSON. Mr. Corgan, do you have the amounts which have been available for anthracite coal research in the last 5 years?

Mr. CORGAN. I have the approximate amounts. We can have that inserted, sir.

Mr. EDMONDSON. I would like to ask you to supply that for the committee, for insertion at this point.

Mr. CORGAN. We will do that.

(The information referred to follows:)

	Amount
1956	$442,000
1955	223,000
1954	237,500
1953	237,500
1952	237,500

Mr. SAYLOR. I have one other question, Mr. Chairman.

On pages 7 and 8, you describe experiments. Were they conducted at the bureau's blast furnace in Pittsburgh?

Mr. CORGAN. Yes, the bureau's small blast furnace at Pittsburgh.

Mr. SAYLOR. Have you found any steel company which is willing to use anthracite for the production of steel?

Mr. CORGAN. You mean in the continuation of the test that we had at Pittsburgh, actually use it?

Mr. SAYLOR. Yes.

Mr. CORGAN. There has been one company in particular that has indicated a lot of interest in the tests that have gone on. I believe that particular company will within a short time conduct tests on a large scale. That is true about that one company but all of the companies have indicated a lot of interest in the experiment.

Mr. SAYLOR. In view of the shortage of good coking coal over a long period the use of anthracite as a substitute, I think, should be of extreme importance and interest to all of the steel companies.

Mr. CORGAN. I believe you are right, sir.

Of course, in order to compete economically the industry must increase its output per man per day. It does seem to be very important to help the anthracite industry because of the great demand we expect for energy within the next few years and because it is a strategically located industry.

Mr. SAYLOR. Are there electric companies using anthracite for the production of power?

Mr. CORGAN. Yes, sir. I would say about 3.5 million tons of anthracite is used for the production of power. Of course, that is primarily within an area of about 75 miles of the anthracite fields.

Mr. SAYLOR. They are using, of course, a smaller size.

Mr. CORGAN. The smaller sizes; yes, sir.

Mr. EDMONDSON. There are three specific research projects which you mentioned in here as possibilities or as desirables. One of them you say:

> Tests in a large furnace will be necessary to determine the suitability of anthracite in a commercial blast furnace.

In another you state that:

> Research and engineering development work planned will include the design and construction of equipment for the production of agglomerate fuel on a pilot plant scale.

Then you say some work has been done on the gasification of anthracite in the past, but activity in this field should be expanded.

Can you tell me in reference to each of those three proposals whether there is a definite project for it, and how it will be financed, or how you feel it should be financed?

Mr. CORGAN. The first one mentioned refers to tests on anthracite as a blast furnace fuel in a commercial furnace. But as to the test work that Mr. Saylor referred to was in the Bureau's small blast furnace. In order for a steel company or anyone else to know how anthracite will perform in a large furnace, it will be necessary to conduct tests in a large commercial furnace.

With respect to the agglomerate fuel that is upgrading of small sizes by the making of a briquet and the calcining of it, we hope, with the funds available, to go ahead on that particular phase. That means the purchase of equipment and actual production of that particular type of fuel.

With respect to gasification, very little work has been done, that is on an extensive scale, as far as anthracite is concerned.

However, with some gas lines going virtually through the anthracite fields, we feel that certainly we should investigate the possibility of the production, in a large way, of a high B. t. u. gas with the possibility of supplementing natural gas with gas made from anthracite.

Mr. EDMONDSON. Do you have funds available for that?

Mr. CORGAN. We got a small increase in funds in this past year, the year that we are just winding up, and we will, of course, be able to use a small amount of those funds, for an economic study only, not for any large-scale work; no, sir.

Mr. EDMONDSON. Thank you very much, Mr. Corgan. We appreciate your testimony.

Mr. Miller, will you present your next witness?

Mr. MILLER. The next witness will be Mr. Scollon and Mr. Perry, from the Division of Bituminous Coal.

STATEMENT OF T. REED SCOLLON, CHIEF, DIVISION OF BITUMINOUS COAL, BUREAU OF MINES

Mr. SCOLLON. With your permission, I would like to put some additional background information into the record covering the coal industry.

I will try not to duplicate the similar information that was given in Mr. LaViers' excellent report.

I would also like to highlight the report which has been made part of the record, the report entitled "Outlook and Research Possibilities for Bituminous Coal, Bureau of Mines Information Circular 7754."

I would then like, with the assistance of Mr. Perry, to discuss and answer any questions on our current bituminous coal research programs.

First, I would like to explain that in general when I refer to bituminous coal, I mean all ranks and types of bituminous coal and lignite.

As a general rule, in Bureau publications concerning the total coal industry, we include all of those coal ranks and lignite.

As was pointed out by Mr. Wormser this morning, bituminous coal production in 1955 amounted to 470 million tons. This was an approximate increase of 20 percent over 1954.

The war peak in bituminous coal production was 620 million tons in 1944, an alltime peak production of 631 million tons occurred in 1947.

Production so far this year is 17 percent ahead of last year.

At this rate, bituminous coal production for the year 1956 should exceed 500 million tons.

For these same years it is interesting to note the trend in productivity. In the war peak year of 1944 production was 5.67 tons per man per day.

In 1947, the alltime high in production, the productivity was 6.42 tons per man per day. This was now risen in the year 1955 to 10.32 tons per man per day and represents a doubling in productivity since the years immediately preceding World War II.

The last time this productivity had doubled was over a period of 50 years. Productivity has increased primarily as a result of increased mechanization.

In 1955 only 11 percent of total production was hand loaded underground; 64.5 percent of the total production was mechanically loaded underground; 1.3 percent was mined at auger mines; and the remaining, 23.2 percent, was mined by stripping.

Thus, a total of 89 percent of the country's production is now loaded mechanically. The high mechanization at present indicates that drastically different methods of mining and types of mining equipment would have to be developed to attain production at rates substantially above current ones.

The labor force in the bituminous-coal industry reached a peak in 1923 of 705,000 men. This dropped to 419,000 men in 1947 and further to 210,000 men in 1955.

In coal production of all types the United States leads the world. The U. S. S. R. ranks second and published reports state that 1955 production approximated 94 percent of United States production.

The U. S. S. R. plans to produce at the end of its sixth 5-year plan, that is, in 1960, 593 metric tons of coal. This is in excess of our current rate of production and nearly equals our record production of 1947.

The United Kingdom ranks third, with approximately one-half of the United States production.

Increased mechanization has brought with it an increase in the relative amount of coal preparation.

In 1939 the percent of total production which was mechanically cleaned was 20.1; in 1947 it was 27.7; in 1953 it was 52.9; and in 1955 it was 60 percent.

At the same time, refuse has increased from 10.6 percent in 1939 to 15.6 percent in 1947 and 18.2 percent in 1953, based on raw coal.

Just one word on transportation. Underground transportation represents one of the chief bottlenecks of the production of coal today. Much research and development work must be done to permit existing and future mechanical mining equipment to work up to capacity. Mr. LaViers has covered other problems of transportation in his reports. I will say nothing further there.

On the very important subject of coal consumption, the peak in bituminous-coal consumption in the United States was 594 million tons in 1943. It dropped to 363 million tons in 1954 and in 1955 has risen to 423 million tons.

Mr. ASPINALL. May I ask a question?

Mr. SCOLLON. Yes, sir.

Mr. ASPINALL. Do you have any figures which show the amount used by industry and the amount used domestically?

Mr. SCOLLON. Yes, sir; I have. You mean retail coal deliveries?

Mr. ASPINALL. That is right.

Mr. SCOLLON. Of the total consumed, 53.8 million tons were delivered to retail dealers in 1955. That, by the way, is near the lowest point of which we have record.

Mr. ASPINALL. Do you have figures which show the first date that they used it domestically?

Mr. SCOLLON. Yes, sir; the first date was 1933 when 80 million tons were delivered to retail dealers and the peak year was 125 million tons in 1944.

I might point out that these detailed consumption figures are shown on page 32 of the information circular which is a part of the record.

During the first 4 months of 1956, bituminous-coal consumption was 20 percent higher than it was during the corresponding period in 1955. The consumption pattern has changed drastically during the last 12 years. There have been substantial losses in bituminous-coal shipments to railroads, retail dealers, and other industrial consumers.

On the other hand, there was a large increase in consumption by electric power utilities and a smaller increase in coke-oven consumption.

In 1955 the electric power utilities were the largest consumers of bituminous coal when they burned over 140 million tons of coal.

Demand by this sector has been doubling each decade and future estimates showed that it will increase substantially.

During the first 4 months of this year consumption in this category was 21 percent above the corresponding period in 1955.

Railroad consumption of bituminous coal dropped from a peak of 132 million tons in 1944 to about 15 million tons in 1955. Railroads are now one of the smallest markets for bituminous coal, and the 1956 trend continues downward. This has been the result of inroads of diesel fuel.

Coke plants used 107 million tons in 1955 and are the second largest consumers of bituminous coal. Consumption at coke plants during

the first 4 months of 1956 was 14 percent above the corresponding period of 1955.

Other industrial consumption reached an alltime low in 1954 of 79 million tons, largely as a result of competition from oil and natural gas, including imported oil.

Although these imports continued to rise in 1955, consumption of coal by other industrials showed a substantial increase to 92 million tons and, during the first 4 months of 1956, was 28 percent above the corresponding consumption in 1955.

Exports of bituminous coal to Canada dropped from 23 million tons in 1950 to 16 million tons in 1954, and increased to 17 million tons in 1955.

Overseas exports of bituminous coal, chiefly to Europe, have fluctuated widely. Substantial shipments were made to Europe during and after World War I, and during the British coal-mine strikes in 1926. From 1927 to 1944, inclusive, shipments to Europe were insignificant. Because of the shortage of coal in Europe after the close of World War II, there were large shipments of bituminous coal from the United States.

Since 1945 exports to Europe have fluctuated from 36 million net tons in 1947 to less than 1 million net tons in 1950. Exports to Europe amounted to 34 million tons in 1955.

Exports to both Canada and overseas during the first 3 months of 1956 are at a much higher rate than they were during the same period in 1955.

Mr. EDMONDSON. Mr. Scollon, does your statement include information as to what extent those exports are subsidized by the Government and to what extent they are in the normal course of trade?

Mr. SCOLLON. No, sir; except for a general statement that the preponderance of it is not subsidized by Government. I do not have those figures.

Mr. EDMONDSON. When you state the majority of it is not subsidized, do you mean by that that it is not part of any Government purchasing program? Is that what you mean?

Mr. SCOLLON. Yes, sir; it is on a free dollar basis.

Mr. EDMONDSON. To what extent would foreign aid to the country involved affect the purchases it would be a little difficult to say?

Mr. SCOLLON. Yes, sir; I have no information on that.

The overseas shortages of coal, particularly in Western Europe and Great Britain, indicate a continuing need for foreign coals. Today the United States is the principal supplier of these coals and probably will remain so for a number of years.

I would now like to say a word on energy consumption, in general. Today bituminous coal represents approximately 28 percent of the total energy consumed in the United States. This is approximately one-half of the share coal had in 1931. Since then, except for the years during World War II, there has been a more or less steady decline in the proportion of coal in the total energy picture.

In 1938 petroleum and natural gas first exceeded coal in the portion of total energy consumed. In 1950 petroleum alone surpassed coal in percent of total energy consumed.

Mr. EDMONDSON. At that point could I ask you this question: Do your energy consumption figures there include automobile fuels, airplane fuels?

Mr. SCOLLON. Yes, sir; all energy, and also waterpower.

In that connection the consumption of energy fuels and waterpower in the United States in 1955 was as follows: Bituminous coal and lignite, 28 percent; anthracite, 1.5 percent; crude oil, 40.2 percent; petroleum products, net imported, 1 percent; natural gas, dry, 22.6 percent; natural gas, liquids, 2.9 percent; waterpower, 3.8 percent.

Shown in the first chart here, which has already been made a part of the record, is total energy consumption by consuming sectors for the year 1955 and in 5-year periods through 1980. These estimates are projections of past trends in the respective categories, adjusted and revised for population growth estimates of the Bureau of Census, gross national production estimates, estimates of power requirements by the Federal Power Commission, estimates of steel consumption by industry leaders, and other factors.

Although there are some differences between these and other estimates of future energy demand, they all fall within a range which indicates that the energy demand during the next 20 years or so in term of bituminous coal equivalent) will increase from 1.5 to 2.5 billion tons. Thus, there is a potential market for 1 billion tons in terms of bituminous coal equivalent of energy.

How much of this additional market will be supplied by coal will depend on many factors, chief among which will be technological advances in mining, transportation, and utilization of coal.

Now, this chart comes from the information circular which has been discussed. In addition to the economic reviews, the report contains a survey of current bituminous coal research. This survey covered 50 industrial companies, 10 State institutions, 18 academic institutions, 8 research institutes, and pertinent departments of the Federal Government.

There are many limitations to the figures in this report, which I will not cover here.

I would like to show in graphic form the information that is in two of the tables:

Here we show the annual expenditures for research by industry in the United States. As is pointed out, approximately $17 million were expended for coal research, $20 million for transportation, $28 million for textiles, $54 million for rubber, $146 million for petroleum, $319 million for machinery, and $361 million for the chemical industries.

Also shown on this chart is a breakdown of the $17 million spent for coal, bituminous coal research:

The Federal Government spent in 1955 $4.9 million; the State governments, $0.6 million; commercial coal industry, $2.5 million; captive coal industry, $1.2 million; equipment manufacturers, $3.2 million; other industrial, $5 million; and universities and unidentified funds, $0.1 million.

Mr. EDMONDSON. Mr. Scollon, at that point could you tell us in general terms how that percentage contributed by the Federal Government on coal compares with the percentage contributed by the Government on other industries?

Do you have any information on that general subject? For example, in the textile industry or in the rubber industry?

Mr. SCOLLON. The only one I have, sir, is in the petroleum industry. As I recall, $1.3 million is spent by the Government in petroleum research proper.

Mr. EDMONDSON. 1.3?

Mr. SCOLLON. $1.3 million, out of $146 million total spent on——

Mr. EDMONDSON. That is, the role of the Government is a much smaller one than in the case of coal?

Mr. SCOLLON. Yes.

Mr. EDMONDSON. Do you have any basis on which to draw a conclusion on these others? I know that the Government has tremendous research undertakings in the chemical industry.

Mr. SCOLLON. I do not have those. I know we can get them for the record if you so desire.

Mr. EDMONDSON. I think it would be interesting to define the role of the Government to determine whether there are other fields where Government's research contribution is much more substantial than is the case with coal. If you can obtain those, it would be helpful to have them.

Mr. SCOLLON. We will do our best, sir.

(The material referred to follows:)

FEDERAL CONTRIBUTION TO RESEARCH AND DEVELOPMENT COSTS

Recent comprehensive figures are those published in Statistical Abstract of the United States—1955, 84th Congress, 1st session, House Document No. 86, page 499, table 594. This table is reproduced below. According to the source given at the bottom of the table, Government funds reported in this table constitute those granted by Government to independent organizations and the totals probably do not include funds spent by the Government in its research and development installations.

No. 594—Industrial research and development—Research cost and personnel, by industry, 1951

[Figures cover approximately 85 percent of all industrial research and development. Based on nationwide survey of companies engaged in scientific and engineering research and development conducted in mid-1952]

Industry	Number of companies reporting	Cost of research			Research personnel		Cost ratios [1]	
		Total cost (in thousands of dollars)	Percent of total sales	Percent financed by Federal Government	Total research employees	Number of engineers and scientists [2]	Average cost per research employee	Average cost per engineer or scientist [3]
All industries	1,934	[4] 1,783,662	2.0	47.0	[5] 220,157	[6] 89,851	$8,900	$22,100
Manufacturing	1,527	1,613,493	2.0	46.5	196,517	79,303	9,000	22,700
Food and kindred products	72	23,764	.3	3.7	2,941	1,357	8,700	16,900
Textile-mill products and apparel	49	15,817	.9	14.4	1,989	734	8,500	19,200
Chemicals and allied products	275	204,170	2.5	7.1	23,211	13,181	7,900	16,500
Petroleum refining	49	92,942	.6	3.1	12,393	4,953	8,100	20,900
Stone, clay, and glass products	38	20,752	1.3	2.7	3,115	1,210	6,600	18,600
Primary metal industries	49	34,415	.4	9.5	3,705	1,703	10,100	21,600
Fabricated metal products	150	38,404	.9	31.1	5,311	2,491	8,000	16,500
Machinery (except electrical)	182	99,334	1.5	23.9	12,668	5,333	8,100	18,500
Electrical machinery	233	431,948	6.4	57.0	51,172	17,243	9,400	28,100
Transportation equipment	104	510,605	4.5	70.7	59,243	21,857	10,000	27,700
Motor vehicles and equipment	26	94,303	1.2	9.4	8,895	1,445	10,900	68,600
Aircraft and parts	62	410,085	12.7	85.0	49,915	20,166	9,700	24,300
Other transportation equipment	16	6,217	.9	52.8	433	246	15,500	30,800
Professional, scientific, and controlling instruments	152	91,447	5.7	57.6	13,442	5,694	7,500	17,900
Photographic equipment and supplies	24	30,794	4.8	29.1	4,330	1,954	7,500	17,300
Other professional, scientific, and controlling instruments	128	60,653	6.4	72.8	9,112	3,740	7,500	18,200
Other manufacturing	174	49,895	.8	31.4	7,327	3,547	8,400	16,300
Nonmanufacturing	407	170,169	1.7	50.8	23,640	10,548	8,300	18,000
Commercial consulting services	281	43,620	47.2	65.5	7,181	3,391	7,400	15,000
Nonprofit research agencies	37	28,517	86.3	56.0	4,588	2,518	6,900	11,700
Other nonmanufacturing	89	98,032	1.0	42.9	11,871	4,639	9,300	23,300

[1] Based on reports from 1,650 companies reporting both research cost and employment.
[2] Professional research staff.
[3] Operating cost of all research and development divided by average employment of research engineers and scientists.
[4] Based on reports from 1,754 companies; total including estimates for 180 companies not reporting is $1,959,100,000.
[5] Based on reports from 1,801 companies; total including estimates for 133 companies not reporting is 234,000.
[6] Based on reports from 1,795 companies; total including estimates for 139 companies not reporting is 94,000.

Source: Department of Labor, Bureau of Labor Statistics, and Department of Defense, Research and Development Board; Industrial Research and Development, January 1953 (a preliminary report).

In addition, an attempt has been made to develop some more recent estimates for research and development expenditures by private enterprise and by the Federal Government in three fields—rubber, petroleum, and agriculture.

One of the bases is the publication, Science and Engineering in American Industry, published by the National Science Foundation in 1955. This pamphlet cites 1953 expenditures by industry, but notes that "over one-third of the RD work conducted by private industry was done for the Federal Government, on either research and development or procurement contracts." Thus, an unknown amount of "industry" funds in reality is Federal money and, therefore, may have been counted twice.

Federal figures were obtained from personal contact with a number of Government employees. They were obtained for 1953 (to be comparable with the NSF data) and include the bulk, though not necessarily all, Government funds. It must be remembered that considerable changes have been made since then, the rubber budget having been cut by perhaps 40 percent and the petroleum (oil shale) budget by about one-third. At the same time, industry has probably increased its funds for rubber and petroleum research, and at least one company is known to be building a demonstration plant for retorting oil shale. Thus, the Government's share in RD funds must have dropped considerably since 1953.

These limitations must be remembered in connection with the following figures:

Estimated costs of research and development on petroleum, rubber, and agriculture, 1953

Commodity	Funds, million dollars			Federal Government's share, percent
	Federal Government	Industry	Total	
Petroleum	[1] 3.1	[2] 145.9	149.0	2.1
Rubber	[3] 9.9	[4] 53.6	63.5	15.6
Agriculture	56.7	[5] 140.0	[6] 258.7	21.9

[1] Includes only Bureau of Mines budget for petroleum and oil shale; 1956 budget is about $2 million.
[2] Includes some coal and some Federal money.
[3] The 1956 figures are nearer $5.8 million.
[4] Includes some Federal money.
[5] 1951 figures.
[6] Includes $62 million from State funds. The figures for 1956 are $85.4 million Federal, and $77.5 million State funds, of an estimated total of more than $300 million.

On this chart we have merely shown graphically the annual expenditures for coal research in the United States. As can be seen, the bulk of the $17.4 million is taken up by research on coke and coal chemicals, amounting to $5.3 million.

Three million dollars has been spent on mining, $2.5 million on gassification, $2.1 million on coal hydrogenation, $1.5 million on coal resources, $1.1 million on combustion, $1 million on physical and chemical properties of coal, $0.6 million on coal preparation, and $0.1 million on storage and transportation.

That concludes, sir, what I had to present in the way of highlights on the industry and of our information circular.

Mr. EDMONDSON. That was a very fine statement, sir.

I wonder if Mr. Perry wants to supplement that statement.

STATEMENT OF HARRY PERRY, CHIEF, BITUMINOUS COAL RESEARCH BRANCH, DIVISION OF BITUMINOUS COAL, BUREAU OF MINES

Mr. PERRY. At the pleasure of the committee, I will answer any questions about current research in the Bureau of Mines.

Since it is nearly $5 million, it is rather difficult to summarize in any short period of time.

I will be delighted to do this, however, if this is the wish of the chairman, or I would be delighted to answer questions about any particular phase of the coal research program.

Mr. EDMONDSON. We had a pretty fine summary from the anthracite chief here as to the promising future avenues of research and promising future programs and projects.

I wonder if you could discuss some of those with reference to bituminous coal and lignite.

Mr. PERRY. Yes, sir; I think I can.

In addition to a number of things we are already doing, I think I can tell you in which direction we think there should be some expansion of our effort. Would this be satisfactory?

Mr. EDMONDSON. Yes.

Mr. PERRY. One of the more interesting things that has happened in the coal research is that for the last 2 years we have been discussing with the Atomic Energy Commission the possibility of a new, potentially large peacetime use of atomic energy. There have been a number of speakers who have referred to the gasification of coal.

The interest in gassification of coal is manyfold. Once the gas is in the form of either carbon monoxide or hydrogen, you can make synthetic fuels out of it, synthetic gas, ammonia, and a whole range of chemicals.

In the process already developed, including the one referred to this afternoon, oxygen is one of the principal constituents. While the oxygen itself can be extracted from air at no charge, the power requirements run the price of oxygen up considerably.

We in the Bureau felt that there was a possibility of nuclear energy being used to supply the heat for this reaction, which is just what oxygen does, and we would then avoid the use of oxygen. Part of the coal would be saved at the same time and possibly this gas could be made at a reduced price.

We have been discussing this matter with the Commission for 2 years now and there is a considerable amount of interest in it because it cannot only be applied to gasification of coal, but to a number of other chemical processes and even possibly to the production of power.

This is one of the projects that we are very anxious to get ahead on on a much larger scale.

We are now experimenting at our Morgantown, W. Va., laboratories on a model, using electrical heating, to determine the reaction rates, the heat-transfer problems, and something about the materials of construction.

At the same time, the Atomic Energy Commission has been making a paper study of whether it is at all possible to design such a reactor as we have proposed and while no final conclusions have been drawn, it at least looks feasible.

This is one of the things that we are very anxious to proceed with.

One of the reasons for that is this: When you make a thousand cubic feet of methane synthetically it takes 4,000 cubic feet of this gas. If the synthesis gas cost is 20 cents to start with the minimum cost is 80 cents for the methane.

So anything we can do in any of these processes to reduce their costs, either coal hydrogenization, methanization, which I was just describing, Fisher-Tropsch, any of these processes, is dependent to a large extent on lowering the cost of gas. This, I am sure, is why

the previous speakers have devoted so much of their time to this gassification problem. This is one of the things which we would like to investigate.

Mr. EDMONDSON. Have you made a request for a reactor or is this still in the drawing-board stage?

Mr. PERRY. We have been dealing with the Commission. Because budget preparation is so far ahead, they will help to support this program next year because of their interest in it. We have agreed informally with the Commission that in future years we would have to support it ourselves through a regular budget appropriation.

Up to this time the Commission has been assisting us with their general research funds in this development.

Mr. EDMONDSON. You have not, I take it, then, made a request for a reactor to be made available to you?

Mr. PERRY. That is right, sir; not in the 1957 fiscal year.

In a new field of this kind the technology moves faster than budget preparation allows so we were not sure whether we should request funds or for how much.

We are interested in better methods of testing coals. The standard methods for testing coals in the United States were developed by the Bureau of Mines back in the 1920's. Since that time there have been a number of new developments in analytical procedures which we think ought to be investigated. We in the Bureau of Mines are asked to arbitrate between two conflicting coal parties on analyses so these things have to be done very slowly and painstakingly. We simply have not had an opportunity to develop the new analytical techniques which we think will eventually save us quite a lot of money because we do all coal analysis work for the military in their coal-purchase program.

We are interested in trying to develop new methods of mining, including better communication between the face and the rest of the mine.

We are interested in studies of new methods of roof support in mines. Most of the accidents, and I unfortunately cannot quote the exact number, but it seems to me in the neighborhood of 70 percent of the fatalities in the coal mines from roof falls are in the first 25 feet from the face.

This is because in many instances it has not been possible to support the roof in that area.

We would like to develop some quickly installed, easily removable support that could be used in this area where the machines are operating.

Mr. SAYLOR. Would that tie in as a portion of your safety program?

Mr. PERRY. Yes, sir. I did not discuss this, but a number of policy questions were asked this morning with regard to the kind of programs we select. I think, that all of the programs are weighed against the principles of conservation, including efficient utilization, and the safety as well as the development of an economically healthy coal-mining industry.

These are the things that we weigh all of our programs against and try to select on the best of our ability, those that we think will lead in this direction.

This, by the way, would be in conjunction with the health and safety people, as you pointed out.

Approximately 60 percent of the reserves, are west of the Mississippi and yet the present production out there is a very small proportion of the total, 5½ percent. We know that in the not too distant future these lower rank coals, sub-bituminous coals of Colorado and Wyoming, will certainly have to be used in the production of power and other things in this country. Certainly the lignite which is relatively cheaply mined in various parts of the country will have to be developed.

We are very anxious to study methods that are particularly applicable to the gassification of lignite. It has different properties than other coals and consequently we think that a different kind of equipment will be desirable and we are planning to test some of them.

These are programs which we are very anxious to get started on, but we have not gotten started on them yet.

We also, of course, feel, and it has been mentioned several times today, that the technical economic studies are important but we simply have not had the funds to date to carry out these studies to the extent that we believe is necessary.

Mr. EDMONDSON. On that point, as to the availability of funds, have requests been made for additional funds for that purpose?

Mr. PERRY. Our 1957 appropriation will be just slightly lower than the 1956 appropriation. The conference report indicates that. The appropriation bill has not been passed, of course.

The 1958 budget is in the preparation state. We will certainly within the budgetary limitation attempt to get the increases that we think we need to carry out this program.

Mr. EDMONDSON. Were your budget requests cut in the Appropriations Committees below what you asked for for your research program?

Mr. PERRY. On part of it; yes.

Mr. EDMONDSON. On any specific programs or just in the overall figure? Can you tell us that?

Mr. PERRY. This just happened Friday. I don't have the figures. Perhaps the acting director could help us on that.

Mr. MILLER. Mr. Chairman, the total cut in the Bureau appropriation in the House committee was $2 million, all of which was restored in the Senate committee, and the conference report which came out last Friday restored about $500,000 of that.

So there was a total net cut in the budget submission this year of about a million and a half dollars. That was spread in several areas.

The most significant single cut was in the Rifle oil-shale program and a complementary piece of that program at Laramie, Wyo. That was about $1,400,000.

The other $400,000 was spread in a number of different places. It would take some considerable detail to show exactly where those cuts were.

It did, however, affect coal to the extent there was some reduction in the coal work, in the petroleum work, and in the minerals work.

Mr. EDMONDSON. Are those reductions going to compel a reduction in personnel that you have at this time?

Mr. MILLER. Yes, there will be a significant reduction in the closing of the Rifle plant.

There will be a layoff there of about 70 people. Some of those will, of course, be reabsorbed in other parts of the Bureau activities and

will be transferred to other stations. There will be a reduction in the force at Laramie, Wyo., a rather small one. The exact number is not known yet.

This action was taken on Friday and we were busy working on it today. I can't give you the exact figure. I would guess the total reduction would be about 80 people.

Mr. EDMONDSON. To what extent will those reductions be in scientific research personnel?

Mr. MILLER. The bulk of the scientific personnel will be transferred to other stations, that is, assuming they wish to accept transfers. We will offer them transfers, but they perhaps will not accept transfers.

We will not deliberately lay off any scientific personnel if we can avoid it. We are having too much trouble recruiting; the principal reductions in the types of jobs will be the mining employment at the Rifle oil-shale mine.

Mr. EDMONDSON. Mr. Perry, if you will pardon a somewhat personal inquiry along that line, how long have you been with the research branch, bituminous coal research branch?

Mr. PERRY. I was in the Bureau twice. I came to work in the Bureau of Mines in 1946, in Pittsburgh, and I have been in Washington since 1951.

Mr. EDMONDSON. So continuously since 1946 you have been in the Bureau of Mines?

Mr. PERRY. Yes, sir.

Mr. EDMONDSON. Mr. Scollon, how long have you been with them, sir?

Mr. SCOLLON. Six months.

Mr. EDMONDSON. Mr. Miller, you have been with them since when?

Mr. MILLER. Since 1928.

Mr. EDMONDSON. I have heard reports that you have been losing some of your career people. That is why I was interested in how long a period of time you have spent.

Mr. MILLER. That was mentioned this morning.

As an example, at the annual meeting of the American Petroleum Institute, the institute has what is called the Bureau of Mines breakfast. The people that come to the breakfast are all former employees of the Bureau. There is an attendance of anywhere from 50 to 100 people, depending on where the meeting is held, which indicates the number of people who formerly worked for the Bureau of Mines.

Mr. EDMONDSON. That experience is by no means confined to the Bureau of Mines.

Mr. MILLER. I am sure that is quite right.

Mr. EDMONDSON. The armed services and atomic-energy people are all giving us the same kind of report. Actually if the Bureau contributes trained people on that basis to our industries, we think that is really quite a substantial service.

Mr. PERRY. There were a number of references this morning to synthetic liquid fuels which might be of some interest. One of the things that I want to mention particularly in connection with synthetic fuels, while it is basically true that we had moved the German processes to this country, we have made some significant contributions of our own.

However, cost studies indicate that something really quite different from the processes now under consideration will have to be developed before we reach a competitive economic position.

Many of us in the Bureau feel very strongly that the only way this will be done will be a continuation and extension of our basic research, that is, "What is coal?"

It is not a homogeneous substance. How is it put together? What can you do to break it up easily? And so among the other things that we have plans for is an expansion of our basic research program in coal.

The carbonization program which represents a large portion of the total research effort is another thing that we have been concerned with.

The Munitions Board originally asked us to make a study of coking coal reserves in the United States at least in the low-volatile field, because of some fear of shortages. We have been making these on a systematic basis and I think we now have 42 county reports.

In addition, we are trying to get a better understanding of what makes a particular coal a good coking coal. We want to understand what you could do to improve this quality in a coal that was not a good coking coal.

Mr. EDMONDSON. This question perhaps should have been directed to Mr. Wormser this morning, but I think he made the remark in his testimony that it was felt that industry and science now had all the information that would be required to go into a mass effort of converting coal into petroleum products or liquid fuels if it became necessary.

Mr. PERRY. I think that the Germans during the war amply demonstrated that that was so. If there is no concern about cost considerations, or if you had to have liquid fuels from coal, we certainly could do it.

Mr. EDMONDSON. If we were to eliminate this economic factor and if we were in a situation where it was necessary to divert practically all of our petroleum production to airplane use and military effort, how long a period do you think it would be necessary to get a mass production underway of liquid fuels from coal?

And by mass production, I would mean something approaching the German effort during World War II.

Mr. PERRY. Ten years, at least.

Mr. EDMONDSON. Ten years?

Mr. PERRY. Yes, sir.

Mr. EDMONDSON. Do you feel that they spent as much as 10 years?

Mr. PERRY. On one process they spent 30, and on the other about 15.

We could carry over some of that technology, but part of this equipment is not being manufactured in this country. We would have to start with manufacturers of equipment. There would be a number of difficulties.

We were discussing this the other day. I am certain it will come as a surprise to you, but if you want to open a mine, to mine a million tons of coal a year, you would not have full production for 6 years.

Now, this is roughly the length of time it takes to develop a mine, about which we know so much. With any synthetic fuels plant you would have to open up new modern mines, so there is a minimum of 6 years there.

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Mr. EDMONDSON. Along this line, now, you are figuring 6 years in this 10-year figure?

Mr. PERRY. Yes; this would be going on simultaneously, of course.

Mr. EDMONDSON. Is there any type of recommendation or suggestion from your Division as to the maintenance of certain mines in a standby status, or stage of readiness for that purpose?

Mr. PERRY. No, sir.

Mr. EDMONDSON. Are most of those abandoned coal mines flooded?

Mr. PERRY. I cannot answer that question. Certainly a number of them are, and it is always difficult to get one back into production even when it is not flooded.

But I cannot directly answer the question as to whether most of them are flooded.

Mr. EDMONDSON. To me this is a very serious statement you have just made, that 10 years would be required to get a mass production of synthetic fuels underway.

Mr. PERRY. By "mass" you meant something like 10 percent of our present requirement, did you not?

Mr. EDMONDSON. Something approaching what Germany did in terms of its overall requirement.

Mr. PERRY. I have not sat down and thought of it precisely in those terms, but I don't believe it will be much different than 10 years.

Mr. SAYLOR. Mr. Chairman, I think he is conservative.

Mr. EDMONDSON. You think it will take longer than 10 years?

Mr. SAYLOR. Yes, sir; I think he is very conservative in his estimate. There is no country in the world that knows any more about mining coal than we do here in the United States. We have the most efficient mines found anywhere.

Yet we know it will take 6 years to get a mine going to produce a million tons a year.

Certainly as intricate a proposition as the synthesis of coal in any one of the processes, let alone anything that has been developed in the meantime, would actually take a long time.

Mr. PERRY. I could insert for the record how long it has taken the SASOL plant in South Africa, that was referred to by Mr. LaViers, to get started, using known technology.

I don't know the number of years, but it has been a considerable length of time. It still is not operating, by the way.

Mr. EDMONDSON. We will be glad to have that figure.

(The material referred to follows:)

CONSTRUCTION OF COAL-TO-OIL PLANTS (FISCHER-TROPSCH PROCESS)

The SASOL plant, a South African coal-to-oil plant, has a daily capacity of 5,000 barrels, of which 4,300 barrels is gasoline, 350 barrels diesel fuel, and the remainder LPG and other chemicals. The firm was founded in 1950, construction was begun in mid-1952, and the first units were put into operation in 1954. Although some products were marketed late in 1955, the plant was temporarily shut early in 1956. Its estimated cost of 40 million pounds sterling, about $112 million, includes opening and operating a coal mine (7,600 tons of coal per day), gasification of coal with steam and oxygen under pressure, purification of gas, synthesis of products in two Fischer-Tropsch plants, upgrading and marketing of products, as well as housing for employees.

According to a 1953 cost estimate, made by the National Petroleum Council, a 27,000 barrel-per-day Fischer-Tropsch plant (17,200 tons of coal per day) would require an investment of $14,100 per daily barrel of product, or $381 million.

These figures are not directly comparable with those for the South African plant because of differences in cost of labor and materials, as well as processing methods. Furthermore, progress made on development of the process since the time of the National Petroleum Council report and since construction of the SASOL plant will further affect these figures, which can serve only as a rough approximation. However, a 5,000-barrel plant satisfies less than 0.1 percent of the daily United States requirement, and a 27,000-barrel plant only about 0.3 percent of our present daily petroleum needs. Thus, although one may allow for favorable modifications of the above figures, the capital required for building plants to cover even one-tenth of present United States petroleum requirements is $12.6 billion, according to the 1953 National Petroleum Council estimate.

Mr. SAYLOR. While we are getting it, will you get us the capacity of it so we will have some idea of the proposed plant when they expect to get it into production?

Mr. PERRY. Yes, sir.

Mr. EDMONDSON. Go ahead with your discussion of any other program.

Mr. PERRY. Well, I could discuss at any length you want the problem on what we currently are working. These are the new things.

Mr. EDMONDSON. What about the one where you said expansion of the program was indicated as being most necessary?

Mr. PERRY. Nuclear gasification would be almost a completely new program for us. We would like very much to get into the development of new analytical procedures because we think eventually it will save money on this type of work. We are very anxious to expand basic research, to get better understanding of what the coal is. We think that this is a way that can develop improved processes for doing these things we are after.

Mr. EDMONDSON. What percentage of your research program today would be classified as basic research?

Mr. PERRY. That is a very difficult question, sir. Not zero, but fairly close to it.

The National Science Foundation defined basic research and, using this definition, I think the best we could do was between 5 to 10 percent.

I think even this was high because of the way it was defined.

Mr. EDMONDSON. Are there any further questions?

Mr. SAYLOR. No, sir.

I want to commend the witnesses for coming here and giving us the overall picture of what the bituminous branch of the service is trying to do.

Mr. EDMONDSON. The gentleman from Colorado.

Mr. CHENOWETH. Mr. Perry, I am curious to know just where we are today on this synthetic process in the use of coal. You came to Washington in 1951.

Mr. PERRY. Yes, sir.

Mr. CHENOWETH. Do you remember about that time, I think it was 1951, there was a great deal of interest, discussion, speculation, even a contract was talked about, about a large plant that was to be constructed in Illinois, where synthetic fuel was going to be manufactured out of coal?

We tried to get it in southern Colorado and I know we spent a lot of time working on it.

What happened to that plant?

Mr. PERRY. Subsequent to that, the National Petroleum Council at the request of the then Secretary of the Interior, Mr. Chapman, submitted a report which indicated that the cost of producing gasoline, for example, from coal, might run as high as 40 cents a gallon after profits.

Mr. SAYLOR. Without a tax?

Mr. PERRY. No; that included the tax. The 40 cents included taxes.

Mr. CHENOWETH. That compares to about 30 cents on the market today?

Mr. PERRY. No; the present wholesale price of gasoline is in the neighborhood of 13 or 14 cents.

Mr. CHENOWETH. That would be 40 cents as compared to 13?

Mr. PERRY. These are not my figures, sir. These are the National Petroleum Council estimates and they spent a considerable sum of money on this estimate.

The Bureau did not completely agree with the National Petroleum Council estimates, and there are quite a number of cost figures which have been developed.

Mr. CHENOWETH. What was the name of the man in the Bureau sponsoring that program?

Mr. PERRY. Dr. Schroeder.

Mr. CHENOWETH. I believe that is his name.

Mr. PERRY. Yes, sir. That was by the coal hydrogenation route. Another way to make synthetic gasoline is by means of the Fischer-Tropsch process.

Mr. CHENOWETH. Was the Koppers Co. involved in that?

Mr. PERRY. This was supposed to be done by an outside investment, not by the Government, so I can't answer.

Mr. CHENOWETH. Was Koppers the company that was selected?

Mr. PERRY. No, sir; I don't believe so.

Mr. CHENOWETH. Well, that is immaterial. In any event, the plant was never constructed?

Mr. PERRY. That is right, sir.

Mr. CHENOWETH. Where are we today, then, on this development of synthetic fuels from coal? Just recently in the State of Colorado a company indicated an intention of locating a plant there.

Mr. PERRY. Was that a low-temperature tar plant, sir?

Mr. CHENOWETH. I think so. The company's name was Cotarco.

Mr. PERRY. Yes, sir.

Mr. CHENOWETH. I think I discussed that with you over the phone.

Mr. PERRY. Yes.

Mr. CHENOWETH. Are you familiar with that process?

Mr. PERRY. In a general way.

Mr. CHENOWETH. It comes out of St. Louis. I believe that the party who has the patent on it—I connect St. Louis with it some way.

Mr. PERRY. That is a low-temperature carbonization scheme in which the coal would be treated at a low temperature to drive off tars which then presumably could be hydrogenated. I didn't know that that process was discussed with respect to Colorado.

Mr. CHENOWETH. They would produce tar.

Mr. PERRY. Yes, which could be hydrogenated and upgraded to a petroleum or middle fraction.

Mr. CHENOWETH. Did you ever get the details of that program?

Mr. PERRY. No, sir.

Mr. CHENOWETH. You have never discussed it with any of their people?

Mr. PERRY. No, sir.

Mr. CHENOWETH. They had a brochure out on it. I think you have described it correctly.

Mr. PERRY. We in the Bureau have reviewed for the last 30 years a number of different low-temperature carbonization schemes. As a matter of fact, we developed a process of our own that looks as if it might be installed in Texas.

Mr. CHENOWETH. Do you not have a process called the Parry process?

Mr. PERRY. Yes, sir.

Mr. CHENOWETH. Is that your process?

Mr. PERRY. No, sir. He is in Denver, Colo.

The difficulty here is not whether it can or cannot be done. We are certain that one can do a low-temperature carbonization of coal.

The difficulty is, does it pay to do it? This depends on what price can be obtained for the tar. If we have a fixed price for the tar, we can make a good guess as to whether it is an economic process or not.

The difficulty has been getting a reasonable price for the tar. One of the mistakes that is frequently made is that this tar is just as valuable as high temperature tar. It may be, but at the moment we don't quite know how to use it as well as we do high temperature tar.

The Bureau, by the way, has a rather large program underway at Morgantown trying to develop uses for this material.

Mr. CHENOWETH. In other words, at this moment the process of developing synthetic fuel is more or less at a standstill?

Mr. PERRY. No, sir. The commercial development from coal is probably at a standstill at the moment.

Mr. CHENOWETH. What we are trying to do is find new ways to use coal, develop a new market for coal. You do not see in the immediate future anything that will bring that about as far as the synthetic process is concerned?

Mr. PERRY. This is particularly true about liquid fuels. In the case of synthetic natural gas the question becomes a little bit more difficult to answer.

As a matter of fact, experts have expressed differing views on this and certainly at some time in the future, and I don't know how many years in the future, we will have to make natural gas out of coal to supply the demand for it in this country.

Mr. CHENOWETH. You are going to make an estimate on that time?

Mr. PERRY. I would rather not because there is such a wide difference of opinion as to when this will be. I can say this, however, that the gas industry in this country is sponsoring research on a long-range basis to have these answers when they need it.

Mr. CHENOWETH. Do you think probably then the production of synthetic gas is going to be more imminent than the synthetic-fuel program?

Mr. PERRY. I think there is an excellent chance this will be the case.

Mr. CHENOWETH. You do not see the synthetic-fuel program in the immediate future?

Mr. PERRY. I think all the cost estimates that the Bureau and anybody else has made indicate that oil shale will probably first compete economically with natural petroleum.

Mr. CHENOWETH. Is that not always the attitude of the Bureau, that oil shale is cheaper than coal?

Mr. PERRY. By the known processes; yes, sir. I don't think there was any prejudice in this direction. I think this is what the cost figures show.

Mr. CHENOWETH. I do not mean prejudice. That has always been their attitude.

Mr. PERRY. Yes, sir; the cost figures indicate that this would probably compete first.

Mr. CHENOWETH. If it comes to the point where we must produce synthetic fuel, then we will go to oil shale before we go to coal. Is that your understanding?

Mr. PERRY. Yes, sir; there are some difficulties, however, which Mr. Ayers has pointed out in his book, on the maximum size of an oil-shale industry.

There is no question, I don't think, that it might come first.

Mr. CHENOWETH. It apparently does not look too promising at the moment.

Mr. PERRY. No. That depends on what position is taken with regard to imports.

Secondly, what happens to the price of petroleum, and, thirdly, how lucky we are in developing some new technology which will bring these costs down appreciably.

Mr. CHENOWETH. Are the costs being brought down gradually?

Mr. PERRY. Yes; certainly on the Fisher-Tropsch.

Mr. CHENOWETH. How much progress are you making in that line? How close are you going to come to ordinary petroleum products in the reasonable future, 10 years, 5 years?

Mr. PERRY. I don't believe we will meet petroleum prices in 10 years.

Mr. CHENOWETH. Never will?

Mr. PERRY. Not in 10 years.

Mr. CHENOWETH. Will it come within some shouting distance, you might say?

Mr. PERRY. Yes, sir.

Mr. CHENOWETH. I think that is all, Mr. Chairman.

Thank you, Mr. Perry.

Mr. EDMONDSON. We appreciate very much your appearing and testifying at such a late hour in the afternoon.

Mr. Miller, do you have something further?

Mr. SAYLOR. Mr. Chairman, might I ask one thing of Mr. Miller?

If they would have ready for us for our future hearings their view as to which of the 14 classifications that we have stated that we would investigate should be conducted by Government, which should be conducted by industry, and which should be conducted on a partnership basis?

Also whether or not they feel, as Mr. LaViers did, there should be an overall governmental agency to supervise whether it be the one referred to by Mr. LaViers or a new agency, or commission set up to handle it.

Mr. EDMONDSON. I think any recommendations that you could give us in those 14 fields will be helpful to us as to your views.

Maybe some of those 14 fields already are being dealt with adequately. Those that you feel are being so dealt with we will appreciate knowing your views on that point.

Did you have any further witnesses, Mr. Miller?

Mr. MILLER. This concludes our presentation, Mr. Chairman.

If you find you wish further information from the Bureau, we will be glad to provide it at any time.

Mr. EDMONDSON. I am sure I can speak for the committee in saying that I am sure we will be seeking further specific information in developing the whole line of inquiry that the subcommittee will be following.

You have been most helpful to us in educating us to a certain extent as to what is being done. We do not consider ourselves educated as yet by any means, but at least we are on the road and we are very grateful to you for the help you have given us. Thank you very much.

The subcommittee will be adjourned until 10 o'clock Wednesday morning.

(Thereupon, at 4:50 p. m., the subcommittee was recessed, to reconvene at 10 a. m., Wednesday, June 6, 1956.)

COAL

WEDNESDAY, JUNE 6, 1956

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE OF COAL RESEARCH OF THE
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The special subcommittee met, pursuant to recess, at 10:30 a. m., in room 1324, New House Office Building, Hon. Ed Edmondson (chairman of the special subcommittee) presiding.

Mr. EDMONDSON. The Special Subcommittee on Coal Research will come to order.

We are pleased this morning to have two of our distinguished colleagues in the House scheduled as witnesses, Hon. Daniel J. Flood, United States Representative from the 11th District of Pennsylvania, and Hon. William Pat Jennings, United States Representative from the 9th District of Virginia. In addition, we have the president of the Anthracite Institute, Hon. Frank W. Earnest, Jr. We are pleased to have these witnesses before the committee.

Mr. Flood, if you are ready, we will be very glad to hear from you at this time. We know of your long interest in this problem and the leading role you have taken in the House in connection with coal problems. We are happy to have you aboard as a witness.

STATEMENT OF HON. DANIEL J. FLOOD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. FLOOD. Thank you, Mr. Chairman.

Coming before this committee, and more particularly this subcommittee on the subject of coal, more particularly anthracite coal, makes me feel very comfortable because I know I am not in unfriendly hands but in very understanding hands. Of course, with my distinguished colleague from Pennsylvania, Mr. Saylor, to your right, who presented us with the resolution to permit these hearings, I know we will have a receptive audience even though he does come from the soft-coal industry, which, technically is not really coal at all, as you know, it is a bitumite. But by courtesy we recognize that in the lexicon of minerals.

I would like to say this is not the first time I have appeared before a subcommittee of this distinguished full committee, and you have evidenced your interest, and concern, and understanding of the hard-coal problem, because extraordinary and expeditious action was taken by you to report out, and it is now law, the bill that I introduced for the so-called mine drainage problem, and which you authorized, and the House authorized and subsequently appropriated, and it is now

law, the $8½ million to bring about a contribution to the mine drainage in the anthracite coal regions of Pennsylvania. So you do more than give lipservice to our problem. You have shown your practical interest.

Mr. Chairman, this morning I have a word or two to say.

We all know the difficult economic problem faced by the anthracite coal industry and by the area in which it is located in a dozen or so counties of northeastern Pennsylvania, which, as you know, is where is centered the great anthracite coal industry. I shall not touch upon the important fuel potential of coal to American defense and the American economy. I take for granted you take judicial notice as members of this committee of the importance of coal for those purposes, and I will not dwell on that.

However, I want to assure you that we do not stand here with our hat in our hand necessarily as suppliants or beggars; we are a virile, progressive, aggressive industry in this year of our Lord 1956. We are doing those things which the industry should do to show its interest and concern in its own welfare. We do not just ask from the Government help, we, too, are trying to do our small bit to the development and sustenance of the industry, as such, and the economy of the area in which it is located.

The industry itself has done much to modernize and to bring about a new and automatic type of equipment for the production of coal. The industry itself has shown a unified association among its members to bring about new ideas and marketing and interest in the use and consumption and the production of its product—anthracite coal.

I say these things, Mr. Chairman, so that we come before you, we feel, now—if I can mix a metaphor—with clean hands, if you recognize it as coal miners that way, and have some rights to ask that you give us this attention and consideration.

It is well said in the purpose of the resolution that something new must be done, we need some new purposes, some new uses, some new utilization, some new thinking in the production of coal, the marketing of coal, the thinking about coal, and the uses of coal. And that is to what you chiefly direct yourselves today.

I have in mind, speaking now of hard coal, the anthracite coal—Mr. Chairman, we hope in your examination of this program that you examine as well the costs of the construction of coal cars, the coal gondolas, the cars that we use to transport our coal by rail. There is a serious problem in the cost of the physical construction, the actual construction of these vehicles, of these coal cars, and we would hope that you would look into that and examine how——

Mr. SAYLOR. By that, Mr. Flood, you mean railroad cars?

Mr. FLOOD. That is correct.

Mr. SAYLOR. Coal hoppers rather than coal cars in the mine itself?

Mr. FLOOD. That is correct. I am speaking now of the coal gondolas that transport the coal rather than the little cars in the mines, drawn by locies, our short term for locomotives. We would hope you could bring about an examination as to consider the improvement to lower the cost per unit of the construction of that particular type of car.

Then again, Mr. Chairman, we hope there will be an improvement in at the same time, for the same purpose, a less expensive carloading process and unloading process. We would like you to examine methods, better methods, less expensive methods in our carloading

and our car unloading, both in the mines for the small car in the mine drawn by the locies, and more particularly the type of car of which we just spoke, the great gondola, a railroad car, for transport of the coal.

Then there are great opportunities we think that should be looked into. They have been discussed, articles have been written. I have an interesting file in my office, and I am sure the committee has even more so, on a more economical distribution of coal.

You should examine the possibilities and potentials of different types and kinds of conveyor belts, perhaps short range, short haul, and long haul.

There should be examined the possibilities of transporting coal by pipeline, using water as the propellant, and flushing under different pressures for short haul and long haul. Those have great and interesting possibilities under this fascinating resolution and what you would like and hope to do for the industry.

Then, Mr. Chairman, I am not sure how this comes within your resolution. I hope it would. That in new uses you would consider marketing, not just how do you use coal. We want you to examine how can you help us market it, what new thinking or suggestion can you bring to us in the area of selling and marketing our coal. We think, we hope that it is one of your problems or one phase of your problems.

There we hope you would examine how can we better and cheaper and better export our hard coal to foreign markets.

I have introduced a bill calling for an export subsidy per ton on hard coal. I have talked to the hard-coal people here and in England last summer, and we are talking in figures of from $3.50 to $5 a ton as an export subsidy.

If, on the other hand, you could bring about a better understanding, a development of a program between us and our industry and our foreign markets with the Maritime Commission of this Government, if you could examine advantageous and better development, better considered charter parties whereby we can remove from our mothball fleet various types of transport craft that we could make colliers under advantageous charter parties between private industry—I am speaking always, you understand, of private industry. I am not speaking of Government injecting itself into this program. I am speaking solely and entirely of private industry and private business in all of these instances. I do not want the Federal Government to do these things except as you are going to examine to help us do these things.

Then again, you know we are in the northeastern part of Pennsylvania, and sometimes we have severe, bad, subzero winters. We have a problem, and we wish you would examine the problem of thawing out of frozen coal in our surface stockpiles, in our transport while in the coal gondolas by rail, as an advantage to the retail dealer, as an advantage to the wholesale dealer, as an advantage to the consumer. There is a problem we feel that you should look into: How can we thaw out frozen coal better than we are doing? What methods can we use that are new? What is the matter with what we are now doing? That problem is interesting and valuable to your coal reserve, and I am sure you would consider that.

As you know, of course, the whole problem of freight rates is historically and traditionally material and vital to new uses of coal, new markets for coal, new outlets for coal, domestically as well as to export areas for export. The whole problem of transport costs is vital and material to this.

In that connection, Mr. Chairman, I have introduced H. R. 3768, which does not deal with a major problem, but I would urge that you bring to the attention of the House Committee on Ways and Means, where my bill rests, a bill in which the industry is greatly concerned. This is nothing but an open-an-shut nuisance tax of the most irritating and annoying style and kind, a 4-percent World War II transportation tax on coal. It is just a pain in the neck to the industry. It is a phychological barrier that would give us no end of a lift if we could get over. It is of no material value to the United States Treasury. The last figure I had 6 months ago, I believe it brings in $968,000 to the United States Treasury.

Now, for various reasons our friends on Ways and Means do not want to open up a Pandora's box of removing the special nuisance excise taxes. You can guess why. But as a special pleader before you, with your purpose, I wish you would look at that and in your report help us in this problem of new outlets and new markets, a new look, a new psychology. Get rid of that pain in the neck for us, and we would be very grateful, and it will not hurt Uncle Sam materially.

Much is being said, much is being done now for the purpose of increasing the quality of use, increasing the volume of use of anthracite in the manufacturing of coke, in coke manufacturing, and hence the blast-furnace reduction of steel by the utilization of anthracite purely as anthracite, the fines, which, as you know, of course, is the small literally fine grains of anthracite which is a result of production and a result of the process of mining and marketing. There we are doing for ourselves in the industry, but we think it is perhaps the greatest avenue for you to examine, sir, to help us go further, to invite in the steel people in this program which we are now pushing strongly in the use of coke plus anthracite or combinations of both in various degrees and at reduced cost. Coke is expensive to make.

Even further than that, the building, the construction, the erection of new facilities to make more coke is an extremely costly process, the construction of such coking facilities. We know and believe and are convinced by the utilization of anthracite in this process of blast furnace production of steel is a great horizon, and unlimited, new horizon, with your aid to help us go further in the new uses for anthracite coal.

I follow that by saying we hope, we feel, we believe that there is a great new avenue opening up before us for additional and increased industrial use of anthracite coal in industry generally.

My mind goes back to the early days. As a matter of fact, anthracite coal was first used in the reduction of steel in the open-hearth furnaces, and in the Lackawaxson plant in the northern part of our State and New York there still remains the vestigial remains of the old open-hearth furnaces where anthracite was first used as a fuel potential in the reduction of steel. We see no reason, if that was so historically, why with your aid and examination in this program of yours this cannot be pursued and a renaissance or reverse of that use brought about again.

Industrially this fuel anthracite must be taken advantage of by industry in many, many ways, which we can show, which we are doing, and which we hope you will pursue.

Now in my district we have been examining for the past 2 or 3 years, in conjunction with the General Services Administration and the Bureau of Mines, Department of the Interior, pursuing further investigations and experiments conducted very successfully by the Bureau of Mines in the utilization of anthractite coal as the fuel potential in the reduction of steel slag and the extraction from manganese slag, and extract the manganese from steel slag, producing a ferromanganese essential and necessary and vital to national defense in view of the fact that most of the manganese is offshore island manganese under the control of foreign countries and must be transported by ship and by surface or otherwise to continental United States.

You cannot make steel or proper steel without manganese, and we do not have in this country proper, good quality manganese any further, and so this Government is now experimenting in my district. That experiment for the time being has been discontinued, but I have here—and if you will permit, Mr. Chairman, to conserve time I will insert at this point in the file or present to you to do so—communications of the Bureau of Mines of the United States Government, communications from the General Services Administration, who now have jurisdiction and control of this plant at Tuxton in my district, which will be of interest to the committee, showing how additional industrial uses for anthracite coal are now being considered, and we hope you follow through. I mention the manganese reduction as a classic example for defense.

Mr. UDALL (presiding). Without objection, that communication when received will be inserted in the file.

Mr. FLOOD. Thank you, Mr. Chairman.

Mr. FLOOD. As you know, I have introduced H. R. 7753, known as the anthracite coal stockpiling bill. I have facetiously mentioned on the floor—every time my farmer boys in the House are discussing land banks, corn banks, wheat banks and food banks, I am pleading for coal banks and, of course, get nowhere, except polite applause. We are paying all of my farmer friends not to plant corn. I would be delighted if you could figure out some way to pay my industry and my miners for not mining coal, but we have not been able to come around to that point. I say that, of course, facetiously.

Actually, I have been before this committee 4 years ago at a full-dress hearing before your subcommittee here, the regular Subcommittee on Mines and Mining, my anthracite coal stockpiling bill, calling for the stockpiling of 10 million tons of anthracite coal per year, and other provisions of the bill which I will not detail, was reported out by a vote—I think all except 1 vote. I think it was a 14-to-1 vote which reported out my anthracite coal stockpiling bill to the full committee. Of course, that was before the upper Colorado thing got straightened out, and I got stuck behind that dam head, literally and figuratively, of the Colorado business and could not get anyplace.

Now, with the Colorado problem out of the way, I hope that you will bring out again my anthracite coal stockpiling bill as one additional problem for you to examine in this whole broad purpose of aiding the industry in many, many ways.

I want to direct your attention now to the mechanical side of the thing. We hope that you encourage, look into, direct, and suggest research which is badly needed in design, new designing, and as well in the construction of coal-fueled gas turbines. We think that gas turbines engines, where the fuel potential is anthracite coal, the new design and construction of such mechanical and physical things are necessary and essential to permit you to pursue the aids in the development of new uses of anthracite coal. Certainly, if you can design, if you can research and design, if you can construct and research and construct for the industry and for industrial uses generally and other uses coal burning gas turbine engines, then you are adding another weapon to our arsenal and to the economy of the Nation.

Along the same lines, Mr. Chairman, we hope that you will encourage and engage in research into domestic—by "domestic" in this case, I mean, for instance, domestic home heating and industrial heating, but also industrial use of coal burning equipment and various new ash disposal units and processes. As part of our marketing program, as part of our sales program, we ourselves have developed new and modern and progressive coal burning equipment and ash disposal equipment, ash disposal units, but we know we are only scratching the surface, and we hope in this great program that yau are undertaking you will do much more for us to encourage and bring about further research which we can help and aid on this great problem of domestic and industrial coal burning equipment as well as ash disposal process units.

There is now going on in my part of Pennsylvania, in my part of the hard coalfields, for the past several years, and we may be on the threshold, we think in the matter of a couple of years, as a matter of fact, of the conversion of coal into gas. We feel that the quality of that gas is of such a nature that we can create domestic gas from our coal by conversion processes, which we are now far ahead in our experiments and research with, and by commingling it and mixing it with existing industrial gases that we can bring about a cheaper and a better and an inexhaustible supply for domestic consumption of all kinds and industrial consumptions of all kinds of a manufactured gas, blending our gas which we will convert and create from coal into the present processes of manufactured industrial gases. And when, we think, the rapidly approaching exhausting of natural gas comes about we will have ready and available for the pipelines, which will then have no further value because there will be no more natural gas—we, with an inexhaustible supply of anthracite coal, can convert a gas and mix it with manufactured gases made from other sources and give this Nation for domestic economy, industrial economy and national defense an unlimited and inexhaustible supply of a new gas. We are about ready to put that in now.

The pipelines the natural gas people have running all over the lot. There is nothing more disconcerting in the hard coalfields than to look out your bathroom window and see a natural gas line going by. But we do not think they will live too long, and we think we can buy up those pipelines very cheaply, and with your help we will put in new gas which will never be exhausted within the rule of reason or the time limit you may have in mind.

There is also, we hope, a program that you will have in mind for research into improved methods of producing electric power through

the use of different turbines. I mentioned the gas turbines. Electric power produced through various turbines we hope will have the fuel potential researched by you as anthracite coal. And again, there is not the act of God which controls water, there is not the ax of nature which bring about these fantastic periodic seasonal shortages of water supply and hydraulic generation of electricity by turbines. We do not have that problem. With all of the other great things you are going to do for us and we are doing for ourselves, we hope you will produce and gather anthracite coal to these turbines as fuel to generate inexhaustible and unlimited-in-time, and without the act of God, man, or the common enemy, or weather to destroy as it does water your potential of fuel.

Of course, Mr. Chairman, by all means, coming down to the beginning of the chain, production, we have done much, you have done much—by "you" I mean the Government—to bring about new and better and improved methods of physical production of coal, the things to produce coal, the things by which coal must be produced, mechanically and physically and structurally. The problems of mining. I will not detail what they might be. They are legion in number, they are manifold.

I hope and pray that in your litany of things to examine to help the anthracite industry, by all means are improved techniques, better techniques, in the whole vast retinue of mining methods and mining production, because the cost of the production of coal is our bete noir outside of water. Our worst enemy, our deadliest enemy, as you know, is water. But that contributes among these many, many other things to the cost of production. Help us reduce our cost of production. Help us put a ton of coal at the head of the shaft on the surface cheaper by examining and researching with us improved techniques to mine and get that coal out of there.

That not too briefly, I am sorry to say, is some of the things that the industry, labor, management, and the people are thinking about; and we have every confidence and have full belief that we are in the very best hands, and we are delighted to know that this Congress and this committee and this special subcommittee is considering so seriously our problem.

Thank you very much.

Mr. UDALL. Let me reiterate that we are happy to have the gentleman from Pennsylvania to make one of his customary aggressive presentations. I think I might say that, at least on the committee here, and perhaps in the Congress, too, when we think of anthracite we think of the Congressman from Pennsylvania who is before us. He is a constant and tireless battler for his industry.

Now you have staked out several areas, rather large assignments, and I just wanted to ask this question: The gentleman does feel that this committee, ultimately, when we reach the point where we make our decision as to the nature of the program we should endorse should be, that we not just tinker around on the edges, but that we mark out several areas and make a major attempt to accomplish something in those fields. Is that what the gentleman means?

Mr. FLOOD. By all means. I do not consider the dignity of this committe executed at all if you merely make a beau geste here. You are dealing with the great fuel potential of America, not the gaseous and liquid fuels, the greatest and most inexhaustible which we are advised

there is. And you must, and we have every confidence and hope and pray that you just not do this once over lightly. This is our only forum. We have no place else to go. We cannot do this ourselves. We cannot afford, we cannot pay for it, we cannot finance this thing. We are economically ill or we would not be here. We are a conservative industry. We do not like to come here. We do not want the Government in our mustache if we can keep you out. We never did. But circumstances beyond our control have produced this condition, and that is why we do hope that your report and your examination will look into these things of the nature which I suggest and meet it head on and give it both barrels.

Mr. UDALL. Certainly I concur, as one member of the subcommittee, with the thought you have expressed that, if the ultimate outcome of these hearings is simply a little bit of tinkering around on a minor scale, as far as I am concerned, I would rather do nothing than not undertake a basic program.

I want to ask you this question: Do you feel that, if this committee is willing to stake out such a program, then Congress will support such a program by substantial appropriations that would be needed to carry it out?

Mr. FLOOD. You do not have to hit me over the head with a club. I am a member of the Appropriations Committee; I catch on very rapidly. By all means, let me assure this special subcommittee that you will have a mouthpiece on appropriations for your purpose.

Mr. UDALL. Fine. Thank you.

The gentleman from Pennsylvania.

Mr. SAYLOR. Let me take this opportunity, Mr. Flood, to congratulate you for your presentation. As Mr. Udall has stated, you have always been since you have been a Member of Congress, and I have been here serving with you, very vocal in your cry for the anthracite fields. While you might look down a little bit from the anthracite heights to us in the bituminous fields, we love you just the same.

Mr. FLOOD. As one coal miner to another, we are in the same league anyhow.

Mr. SAYLOR. Mr. Flood, as a member of this committee, I sincerely appreciate your coming here and giving us the thinking which you have on some of the avenues that we might investigate and look into and help the anthracite field.

In the testimony that was given to us Monday there was concern about possible duplication or repetition of efforts. As vast as the areas are that you have outlined, do you feel that there is at the present time any duplication between the anthracite branch of the Bureau of Mines in their research program and the research program being carried on by the Anthracite Institute sponsored by the Anthracite field itself?

Mr. FLOOD. Mr. Chairman, my purpose is not evasive, but there is present Mr. Frank Earnest, who is the president of the Anthracite Institute, and if you would permit, I would yield that question to Mr. Earnest, and you will get precisely the kind of answer you want to such a very important question.

Mr. SAYLOR. Then the other question that I have was whether or not you had any preference in the fields which you have outlined as to whether or not the Government should take them up, whether or not

the industry should take them up, or whether there should be a joint venture in any one of these fields.

Mr. FLOOD. This is the nature and kind of industry, Mr. Chairman, that is eager to join in. As I told the committee a moment ago, we have a bad dollar situation. You know our dollar condition of the anthracite-producing companies. When they could they paid their way and never asked for a dime for anything. Now they have a bad economic dollar problem. I do not know how far they can go. But our reputation, our history, as such—and the Government knows it well—is that if it is just the widow's mite that we can pay, that we will pay.

Mr. SAYLOR. Mr. Flood, I am curious to find out whether or not the bill which was passed here under your sponsorship, and is now law, has any work been undertaken yet to get the dewatering started?

Mr. FLOOD. As you know, this was a matching bill. The State of Pennsylvania had to match the Federal appropriation of $8,500,000. The authorization passed, the appropriations have passed. The coal companies themselves have borne the burden of the preplanning and designing of certain projects. I believe the first such project will be the construction of a dike opposite the borough of Duryea in my district on the Lackawanna River to prevent the entry of the Lackawanna River into vast openings of the mines brought about by recent floods in northeastern Pennsylvania.

In the borough of Plymouth, the Bureau of Mines of the State of Pennsylvania last week were there with the borough council to consider the construction of sluiceways and other conduits of different construction, mostly earthern, and some stone facing, to eliminate drainage problems in the suburban areas of the borough of Plymouth.

Those two projects are about, I believe, to proceed and get underway.

In fairness to the coal companies, I repeat for the purpose of emphasis, they have already paid and done their preplanning and designing part, and all of the engineering and planning is being done by them at no cost to the State of Pennsylvania or the United States Government.

Mr. SAYLOR. I am delighted with that report. I take this opportunity to thank you for appearing before our committee.

Mr. FLOOD. Thank you, Mr. Chairman.

Mr. UDALL. Congressman Jennings, our colleague from Virginia, had to go to the Agriculture Committee, so we will go along with Mr. Earnest, president of the Anthracite Institute.

I notice we have a copy of your statement. Our customary procedure is that you may read the statement or you may file it for the record and you may orally amplify the statement, whichever you prefer.

STATEMENT OF FRANK W. EARNEST, JR., PRESIDENT, ANTHRACITE INSTITUTE, WILKES-BARRE, PA

Mr. EARNEST. Mr. Chairman and members of the committee, I did not intend to read the statement, so if it can be filed, I would appreciate it.

Mr. UDALL. Without objection, it will appear in toto in the record.

(The statement follows:)

STATEMENT BY FRANK W. EARNEST, JR., PRESIDENT ANTHRACITE INSTITUTE—WILKES-BARRE, PA.

My name is Frank W. Earnest, Jr. I am a resident of Wilkes-Barre, Pa., and president of Anthracite Institute, an organization representing companies producing more than 80 percent of the total anthracite mined in this country.

For a number of years, Anthracite Institute conducted a research program for the industry. From 1936 through 1953, inclusive, the institute spent $3,400,000 on research or an average annual expenditure of approximately $189,000.

Immediately following the end of World War II, the anthracite industry recognizing the vital importance of research as a means of industry survival, stepped up its research program. As a result, for the 4-year period, 1946–49, inclusive, the institute research program averaged an annual expenditure of $250,000.

In addition to the research program conducted at the Anthracite Institute Laboratory, Anthracite Institute also sponsored a research program at Mellon Institute for a number of years and, along with the Commonwealth of Pennsylvania, jointly sponsored a research program at Pennsylvania State University School of Mineral Industries.

The institute research program was largely concentrated on the development of improved burning equipment for the space-heating market, and particularly the residential heating market. This was a logical objective since anthracite had always been used chiefly as a residential heating fuel.

During the 4-year period 1946–49 institute research brought forth new burning principles that were incorporated into heating units that constituted the finest domestic heating equipment ever evolved for the combustion of anthracite. The new equipment included revolutionary methods of burning anthracite at high efficiencies with greatly improved consumer convenience. Research also brought about new commercial and semi-industrial anthracite burners.

A comparison of the anthracite heating equipment that was available at the end of World War II with that which is on the market today convincingly demonstrates that great progress has been made in anthracite domestic and commercial heating equipment as direct and indirect results of the anthracite research program.

However, economic and political trends have combined to reduce materially the benefits that otherwise might have accrued to the anthracite industry, through the successful fruition of its research program. The unrestricted imports of foreign oil and the invasion of traditional anthracite markets by natural-gas pipelines, bringing in competitive fuels from great distances, have tended to upset the normal action of the law of supply and demand. Two fuels competitive to anthracite have been permitted by Government sanction to usurp much of the residential and commercial space-heating markets formerly enjoyed by the anthracite industry, thereby minimizing the value of the new space-heating equipment developed by research.

The loss of these markets brought about depressed conditions in the anthracite industry. Industry production dropped from 59 million tons in 1946 to 26 million tons in 1955, a loss in 9 years of 33 million tons or 56 percent. External competition with oil and gas led to a diminishing market, which in turn led to bitter internal competition within the industry itself, which inevitably brought about a situation wherein most anthracite producers for a number of years have operated at a loss. As a result of the great drop in anthracite production, employment in the industry dropped from 78,000 in 1946 to 36,000 in 1955. It is obvious that the resultant unemployment has had a depressing effect upon the economy of a large section of northeastern Pennsylvania where anthracite mining is the principal industry.

The desperate financial condition of the anthracite industry made it impossible to continue industry research after 1953, even though the urgent need for the development of non-space-heating uses of anthracite was fully appreciated. Since that time research on anthracite has been conducted by the United States Bureau of Mines at its Schuylkill Haven Laboratory, by the School of Mineral Industries at Pennsylvania State University, and by a few individual anthracite producers.

The industry realizes that a much larger program is necessary to bring about the new uses for anthracite that must be developed in order to breathe new

life into the industry. Furthermore, it is the opinion of our industry, that considering how the coal industry during World Wars I and II rose to magnificent heights to supply the country with extraordinary energy requirements, the Government has a vital interest in assisting the coal industry to survive so that it will be ready for the next emergency.

In addition to its value as a space-heating and power-producing fuel, the anthracite industry's survival is important to the Nation as a source of a fine metallurgical fuel. The use of anthracite as a metallurgical fuel dates back to the 19th century and during the years 1854 to 1874 anthracite was the No. 1 metallurgical fuel in the United States. While for reasons of economics and geography the use of anthracite as a metallurgical fuel dwindled, after the turn of the century, recent shortages of commonly used metallurgical fuels again highlight the value of anthracite for this purpose. Tests by the United States Bureau of Mines at Pittsburgh, early this year, showed experimental blast-furnace operations to be satisfactory with anthracite substitutions for coke up to and including 60 percent of the total fuel. However, an extensive research program is necessary to demonstrate, through practical blast-furnace operation, the present-day value of anthracite as a metallurgical fuel.

Two other uses of anthracite as a metallurgical fuel lie in the pelletizing of taconite and the sintering of fine iron ore. Both of these uses of anthracite are exceedingly important to the Nation as means of utilizing low-grade iron ores. While anthracite is already being used in increasing amounts for taconite pelletizing and ore sintering, considerable research must be done in an effort to obtain additional data needed to improve operation techniques.

Many energy experts predict that the Nation's fuel-oil and gasoline requirements must be augmented by synthetic fuels made from coal or oil shale, and that decreasing reserves of natural gas must be supplemented by coal gasification. Here are two other fields where research on anthracite leading to the practical availability of synthetic oil and high B. t. u. gas would be decidedly in the Nation's interest. The strategic location of anthracite mines, within a radius of a few hundred miles of the Nation's densest population and industrial areas is of prime advantage in the location of synthetic-fuel industries.

To expand the market for anthracite, two primary objectives must be considered: (1) The development of new uses for the product, and (2) the development of new mining techniques.

As indicated above, the fields of metallurgy and gasification, at this time, show the most promise of consuming tonnages of sufficient volume to have a rejuvenating effect on the industry and, in turn, on the economy of the area in which the coal is produced.

Research on anthracite as a metallurgical fuel should include the following studies:

1. The use of anthracite as a supplementary fuel to metallurgical coke.
2. The possibility of developing a metallurgical fuel from anthracite, superior to coke, thus improving the Nation's steel productive capacity. This would include studies of calcination and briquetting.
3. The development of improved methods for using anthracite in upgrading or agglomerating iron ore in connection with sintering and taconite pelletizing.

Research on the gasification of anthracite should include:

1. Investigation of a program for the production of synthesis gas for reforming in order to obtain gasoline, fuel oil, and alcohols.
2. Research on the production of high B. t. u heating gas to supplement pipeline natural gas for heating and industrial purposes.

Concurrently with the demonstration of the technical feasibility of the use of anthracite in the metallurgical and gasification fields, it is imperative that coal be mined at a cost that will permit the producer to sell at a price that will not only provide him with a fair profit but which will also prove economically attractive to the consumer. The attainment of a favorable cost level will require the development of new mining machinery and methods. At the present time, output per man per day approximates 4 tons; by the development of new mining equipment and procedures it is well within reason to expect to increase this rate substantially, thereby materially reducing the cost of the mined product.

Research on new anthracite mining techniques should include:

1. The development of new mining equipment and methods for the shearing of anthracite from the face.
2. The development of a large diameter auger for the removal of anthracite, such as is already being done in bituminous coal mining.

3. The development of improved roof supports and a telescopic shield for the rapid advancement of rooms and gangways.

4. The investigation of any other techniques that give promise of providing means for increasing anthracite productivity.

The above avenues of investigation represent those which, in the opinion of the industry, will produce the speediest beneficial results. The industry is highly conscious of the fact that it is not only a question of sufficient money being allocated for anthracite research, but also that the research be directed into channels which offer the best hope for immediate results.

There are other facets of anthracite research which might be considered more in the long-range category. These would include such programs as underground gasification, the use of anthracite as a raw material for the production of calcium carbide, as electrodes in the aluminum industry, as a source of graphite, as a source of silicon carbide for abrasives or refractories, and other industrial process uses. No doubt these and many other research investigations should also be made in the future, but the funds immediately available should be allocated first to the studies of anthracite as a metallurgical fuel; second, to development of new mining techniques; and, third, to studies of anthracite as a high B. t. u. gas, and as a synthesis gas.

Excellent research work on anthracite has been and is being conducted by the United States Bureau of Mines Anthracite Experiment Station at Schuylkill Haven, Pa. It is the opinion of the anthracite industry that a sizable amount of any Federal funds available for anthracite, as a result of the legislation now being considered, should be allocated to the United States Bureau of Mines for experimental research at the anthracite experiment station.

We should like to invite your attention to the fact that the cost of research along the lines indicated above would be considerably more expensive than the cost of research conducted by the industry when its main problem was the development of new heating equipment. The type of research the anthracite industry now requires, along industrial lines, entailing the construction of pilot plants and demonstration plants, would, by its very nature, cost a great deal more than experimental research on heating equipment. Where institute research at its peak averaged an annual expenditure of $250,000, it would be our opinion that in order to conduct a successful program on industrial anthracite research, and to conduct it expeditiously, an annual appropriation of at least $2 million would be required.

Furthermore, we believe that the appropriation of the necessary funds for such research is properly within the province of the Federal Government, since most of the program will be directed at obtaining results which will be vitally important to the Nation's security and economic growth.

Mr. EARNEST. I would like to make a few comments on some corresponding items that are not in the prepared statement.

I would like to first refer to an observation which was made in your letter that was written to the members of the coal industry, in which you said that the once thriving domestic coal industry has suffered a drastic decline through the loss of markets to other forms of fuel during a period of recordbreaking prosperity. I just want to say that I represent an industry that fits that observation you made very clearly and distinctly.

The anthracite industry—and I am not going to deal in the past, just only as a reference—in 1946 produced 59 million tons and in 1955, 26 million tons, a drop of 56 percent. We had a manpower drop of from 78,000 in 1946 to 36,000 in 1955. Naturally, I am sure you are familiar with the effect that has on the economic conditions of the whole anthracite industry, or rather the region itself.

Yet, on the favorable side—and that is what the members of the committee, I know, are interested in determining—anthracite is still an important natural resource. Last year the payroll alone was $100 million; the sales at the mines, $275 million. We paid railroads $71 million for transporting the coal, plus many other millions in the handling at the retail level.

Anthracite has always been important, just as bituminous, in peacetime, but particularly in war.

I have said at other congressional committee hearings that I do not feel that the coal industry ever received the credit it was entitled to for the great job it did in World Wars I and II.

In getting around to the research question, our industry spent from 1953 to 1956 $3,400,000 in research. I personally had charge of the direction of that program.

In additional to the research in our own laboratory, we had additional programs at Mellon Institute and also at Penn State.

Most of the money that was expended in those years was for the improvement of domestic heating equipment. By that I mean the residential type of heating equipment. A comparison of the equipment to burn anthracite that is on the market today as compared with what existed at the end of World War II is sufficient evidence of the great job that was done researchwise on domestic heating equipment.

On the other hand, economic and political trends destroyed to a great extent the value of the research. And I am referring to the importation of foreign oil and the gas transmission lines that were built.

In other words, the importation of foreign oil, particularly, destroyed the law of supply and demand in this country.

Certainly, as an industry, we are not objecting to the competition of oil and gas as produced in this Nation, but when we are importing oil from the Middle East and from Venezuela, particularly, and now under contemplation the importation of gas from Alberta, we feel that that is again destroying, as I mentioned before, the law of supply and demand and affecting our industry seriously.

Just to give you one example of residual oil, we lost over 2 million tons of No. 1 buckwheat in the New York market alone.

There was a time not over 2 to 3 years ago when you could have taken all of the labor cost out of the coal and oil still would have been cheaper, the Venezuelan oil.

We have advocated as an industry for some time, and with strong support from the bituminous industry, a national fuel policy. I think right now that is probably politically impossible but at the same time I think what you gentlemen are doing—and our industry certainly appreciates what you are trying to do—is leading to some help for this great natural resource of coal.

I want to pay tribute to this committee for the work I know they have done directly and indirectly on trying to stop the huge imports, particularly of the residual oil.

Coming to the question that your committee is interested in, and Congressman Saylor's bill, what to do about it from a research standpoint. While I spell it out in the paper which you already have on file, I can only repeat very briefly what has been said already by representatives of the Bureau of Mines, that I think our greatest opportunity is in the blast furnace field. I believe Dr. Miller of the United States Geological Survey testified on Monday of the shortage of metallurgical fuel. Anthracite was used many years ago. With additional research funds, I believe it can become an important factor in our future production.

We also are hopeful of the development of a briquette made of fine sizes of anthracite, and then silicon may be an even superior fuel to coal in the blast-furnace field.

Mr. SAYLOR. Mr. Earnest, before you leave that subject, I am very, very much interested in the potential which was outlined by Mr. Miller, and especially knowing the shortage of reserves for coking coal.

Mr. EARNEST. Yes, sir.

Mr. SAYLOR. Could you tell us for the record, is anthracite a high- or low-volatile coal?

Mr. EARNEST. Very low. Anthracite will average around 5 or 6 percent.

Mr. SAYLOR. Has the Anthracite Institute done any research that you know of to try and make the usual coke out of anthracite coal?

Mr. EARNEST. No, Congressman; not directly; and I do not think it is necessary to make the usual coke. If you will pardon a commercial, I think anthracite is as good as coke if it could be proved to the steel companies with further tests and perhaps more research at some laboratory.

You, see, for many years all of the reduction of the iron ore was made with anthracite, and anthracite is practically a pure carbon anyway, around 86 or 87 percent. So that even in its present form I do not believe it has to be made into a coke. I mean, we hear research experts says, "For X dollars we will give you the secret of how to make coke out of anthracite." We do not need that, we do not believe. Does that answer your question?

Mr. SAYLOR. I think it does.

Mr. Miller said that they were experimenting up at the anthracite laboratory on some of this work. Do you know or does your Institute know of any steel company that is willing to undertake some experimental work along the line of using some anthracite for the production of steel in the place of coke?

Mr. EARNEST. Yes, sir. The industry will cooperate to its financial ability; and in the tests that have been run, some of them, the coal companies have furnished the coal?

Did I miss your question?

Mr. SAYLOR. I think you missed the question. I am not interested in that. Do you know of a steel company that is willing to run the experiment on more than just a test-tube operation?

Mr. EARNEST. I understand that the Bureau of Miines, who is handling the contact at the Federal laboratory at Schuylkill Haven, have a steel company—I do not know whether they have announced the name. I know who it is but I do not think I am privileged to announce it—that will go ahead with those tests.

The problem is this: The steel company, working at 100-percent capacity, does not want to tear down a blast furnace to run an experiment on something. It is the old story, I think, that none of us meet a situation until we come to it. As long as they can get coke and it might possibly interfere with their production, they are just not doing anything about it.

Mr. SAYLOR. I can say I have always felt that the anthracite people missed the boat a few years ago when there was such a tremendous shortage of coke, in that they did not get some steel company then to undertake this experiment.

Mr. EARNEST. We did, Congressman, to this extent: That there was a lot of anthracite used in blast furnaces during World War II. It happens in every war we get in. But then again, in the cry for production there are no records kept, and they just fill in roughly 10 percent, and they set up a list time that only 10 percent is the maximum that can be used. But the tests run in a smaller pilot plant at Pittsburgh by Dr. Buell of the Bureau of Mines shows you could use up to 60 percent.

I was in a meeting with all of the vice presidents of the steel companies, and they said what was short here was actual data as to what anthracite did in the furnace.

Perhaps you are right. Maybe we should have gotten a hold during the war of a steel company and said, "We are going to put the instruments in here and work with us." But I am afraid they would have said to us, "But don't bother our men."

Mr. SAYLOR. The reason—you know there was such a tremendous shortage of coke that the Government, instead of using the new and modern methods, actually made loans to certain coal companies for the production of coke in the old beehive oven.

Mr. EARNEST. That is right. But you see, at the same time, Mr. Congressman, the demand on the anthracite industry was such for heating homes and for taking the place of oil. Oil comes in whenever there is not a war and takes the market away, but when there is a war they have to go to war and we get the crumbs back afterward. I am not criticizing the oil industry. I am merely stating facts.

Mr. SAYLOR. That is correct; and it is as true for the bituminous fields as well as the anthracite fields.

Mr. EARNEST. That is correct.

Mr. SAYLOR. I have seen it happen so very often.

Mr. EARNEST. That is right.

Mr. SAYLOR. Pardon me for the interruption.

Mr. UDALL. Excuse me for interrupting here, too. I want to ask a couple of questions as I have to go to another committee and our chairman has returned.

Mr. EARNEST. Yes, sir.

Mr. UDALL. I was very much impressed in your written statement wherein the facts you cite indicate your industry did exert itself strenuously in the field of research and spent a considerable amount of money, and that only when the financial conditions became acute in the last 2 or 3 years have you now been forced into a position where you really cannot afford to do research. That seems to me to be the best argument for invoking the type of program we are considering here.

I notice, too, you lay stress on the fields of metallurgy and gasification. Again that agrees with my thinking on it. It seems to me if this committee has to make a decision and to say we are going to leave this area or that area to the industry and we will make a major effort in some other area, that it would be my thought that these two fields you mention certainly are areas where research might pay off very big dividends; whereas some of these other matters, such as improvement of mining methods, might more properly, if we have to neglect some areas, be left to the industry.

Do you agree with that thinking?

Mr. EARNEST. Yes, sir; in general I do. I think we are in a situation here or a condition of where if the appropriation was sizable enough that we could explore this question of blast-furnace fuel, it might change the whole picture of the anthracite industry and some of the other matters could follow.

Mr. UDALL. That is all.

Mr. EDMONDSON. Go right ahead.

Mr. SAYLOR. Go ahead and we will interrupt from time to time, Mr. Earnest.

Mr. EARNEST. That is perfectly all right. I wish you would.

For the benefit of the chairman, I am not following the written statement.

The United States Bureau of Mines, in my opinion and the opinion of our industry, has done recently an outstanding job in at least the work that they have done with the money that has been available. There was a time when they had a fine building and no funds at all, and now the funds are entirely inadequate to do the type of job that should be done. I think they have the vision. Certainly Joe Corgan, who testified on Monday, is approaching it on a very courageous base, and I know they subscribe to much of what I have said regarding the blast furnace and the ultimate gasification.

Having had experience in research, as I said, and having been in charge over a period of years of the domestic heating equipment research and realizing the costs, I want to say to this committee that I think it would take a very sizable amount of money to do the research work that is necessary for the anthracite industry.

On the other hand, I am not one who wants to wait to spell out and cross every "t" before a program is inaugurated, because I think it is so urgent that something be done.

Mr. EDMONDSON. When you say "a sizable amount of money," what do you have in mind in your terms?

Mr. EARNEST. I can only pick a figure out, but it is not just picking it out of the air. If we spent an average of $250,000 a year on just domestic heating equipment, when you consider the pilot plants that are necessary and perhaps the building of large gas producers, I would say $2 million a year would be a substantial figure that would produce excellent results.

Mr. EDMONDSON. Thank you.

Mr. EARNEST. Again, I do not have anything else. I would rather have you ask me the question. Except to say in conclusion of my statement, I think this is something the Government can do; it certainly logically can do for our industry.

There is one more point here that I know your committee recognizes and the public as a whole does not recognize, and that is that you must keep up the productive capacity of the coal industry.

I have a statement here that you might be interested in because I have testified many times on the question of imported oil. Here is what a leading executive of the oil industry said on this productive capacity:

> Reserves taken by themselves are not the most important thing neither in an emergency nor in times of peace; it's ability to produce. For instance, if the United States were at war and we had reserves of, say, only 20 billion barrels, which is only two-thirds of what we have now, and if we needed, say, 7 million barrels a day and could product that, we would be better off with a producing

capacity of 7 million barrels a day and relatively smaller reserves than we would be if we had 100 million barrels and could produce only 4 million.

I think the oil industry changed their position considerably since then because of the huge importation of foreign oil. But at the same time it fits our picture. As you continue in both bituminous and anthracite to lose manpower, you cannot pick it up. Yet we have a total overall estimated demand for energy that is almost astronomical in its figures.

Mr. SAYLOR. Mr. Chairman, I would like to ask Mr. Earnest a few questions.

Mr. EDMONDSON. Mr. Saylor.

Mr. SAYLOR. Mr. Earnest, we have had some testimony here from other people with regard to the tonnage per man per day in the bituminous fields. Could you give us the average production tonnage per man per day in anthracite?

Mr. EARNEST. The average in anthracite is 4 tons per man per day. That is the overall, and it has only reached that figure recently because of the emphasis on the No. 4 and 5, the very small sizes. Prior to that and in deep mining, it is about 3 tons per man per day, much smaller than in bituminous, as you know, Congressman, for the reason that our coal is more difficult to mine, it is harder in its structure. As the research program moves along, I think that that—and I mentioned that in the paper—is something that could be done to improve our mining methods and thereby increase our production per man per day.

Mr. SAYLOR. Mr. Earnest, has there been any duplication between the research that has been conducted by the Anthracite Institute and that conducted by the Bureau of Mines?

Mr. EARNEST. No, sir. Our research at Anthracite Institute was stopped in 1953 for only one reason, financial reason. Then about the same time, however, the Bureau of Mines received an extra appropriation so that the total amount of money that is being spent is more now than it was in 1953 even though it is still inadequate.

Mr. SAYLOR. Has the Anthracite Institute figures that they can show us or you can submit showing, first, the direct loss of markets to foreign residual oil?

Mr. EARNEST. Yes, sir.

Mr. SAYLOR. Mr. Chairman, I would like to ask at this point it be inserted in the record by Mr. Earnest, figures which would show the loss of markets by the anthracite fields to residual oil.

Mr. EDMONDSON. Do you have those figures available?

Mr. EARNEST. I do not have them with me, but I will supply them. If there is anything we have, it is figures as to where our tonnage has gone. We will be glad to present it to the committee.

Mr. EDMONDSON. We will be glad to receive it.

Mr. SAYLOR. Mr. Earnest, one of the fields of potential use for coal in the future will be an increased use of electricity. What has been your experience over the past number of years? Can you show the amounts of coal that were used by utilities for the production of electricity as from coal, from anthracite, what the amount is now, what the potential is in the future?

Mr. EARNEST. Right now it is about 3 million tons a year used by the public utilities. But I am not optimistic that that is a potential for increased tonnage except in the immediate area of the mines.

Mr. SAYLOR. Most of that 3 million tons is actually used in the northeastern part of Pennsylvania?

Mr. EARNEST. Yes, sir. We cannot compete with bituminous on a straight B. t. u. basis, as you know, Congressman.

I am only being factual when I say I do not think that is a large market unless we could find some way that is not apparent now that electricity could be produced cheaper with anthracite than bituminous, and I just do not think it can be done.

Mr. SAYLOR. Mr. Chairman, it has come to my attention since these hearings started on Monday that the Navy and the Air Force have apparently done considerable research, because they have just sent a letter to the Appropriations Committee asking for an appropriation of $35 million for the acquisition of a tract of land in your home State, and it is for the creation of a new fuel to be used by the Navy. So that I think it is incumbent upon us to call upon the Department of Defense to come forward here and tell us what research they have done along these lines, because there is no telling just what help it might be not only to the bituminous field but also to the anthracite field.

Mr. EDMONDSON. If the gentleman is speaking of a plant to produce jet fuel, I understand it is a somewhat classified project at this time. So I do not know whether the Department of Defense will want to come in and give details concerning that or not.

Mr. SAYLOR. I do not know what they want, but I understand it is based on coal; so they might give us the advantage of their research.

Mr. Earnest, you referred to the report which the committee made on the fields in which we are going to investigate. If the anthracite field—I am going to ask you to confine yourself to that—if the anthracite field were able to do any research in any one of those 14 classifications, what would you choose as your field and which ones would you ask the Government and the Bureau of Mines to supervise?

Mr. EARNEST. I would pick the industrial metallurgical use of anthracite, and I do not know which one. It is not spelled out specifically, sir. But wherever it fits under those 14 categories. It could come under "carbonization processes," I imagine, under 10. It would be 9, 10, or 11, along in there. That is in our opinion the one that offers the greatest hope of immediate relief.

Mr. SAYLOR. The representative from the United States Bureau of Mines talked about the new type of posts they were using, the flexible posts.

Mr. EARNEST. Yes, sir.

Mr. SAYLOR. Has the industry adopted them generally?

Mr. EARNEST. I think it is too early for that. I am not a mining man myself, but from what I understand I think it is too early for general adoption. I think the Bureau of Mines would say that themselves. It is still in the research stage, but it is a good step forward, the work they have done.

Mr. SAYLOR. Has the industry generally adopted the roof bolts which have become so popular in the bituminous field?

Mr. EARNEST. No; because of our different conditions of mining, I think that is still in the research stage.

Mr. ASPINALL. Will my colleague yield?

Mr. SAYLOR. Yes.

Mr. ASPINALL. One of the difficulties as far as research on roofs and the use of bolts is the fact that the veins of anthracite are not always horizontal. The fact of the case is, am I not correctly informed, that perhaps 60 percent of the coal stands on an incline which it is impossible of bolting, and only about 40 percent which could be bolted? Is that correct?

Mr. EARNEST. I am not sure of the percentage, Congressman, but that is approximately correct, I would say. We have a great amount of pitching veins.

Mr. ASPINALL. It is my information that one of the companies in the area which you represent has recently hired a young mining engineer by the name of Mr. Sheldon Wimpfen.

Mr. EARNEST. Yes, sir.

Mr. ASPINALL. One of your companies.

Mr. EARNEST. He is vice president of the Glen Alden Coal Co.

Mr. ASPINALL. He has recently written me and has told me of the appearance which you would make here today. As I read his letter, it is to the effect that the industry is in a very depressed condition at this time. My question is: Will the industry and the different parts of the industry be able to continue any sort of a research program such as they have followed, we will say, for the last 5 or 6 years, unless the economic conditions become better?

Mr. EARNEST. No, sir; I do not think they will for the reason that the general research program was discontinued in 1953. There may be some individual companies that will do a certain amount of research work, but I think it would have to be less, rather than greater, until such time as we can find some way of increasing our market.

I understand the company Mr. Wimpfen is with—and the reason I call his name, he used to be manager of the raw materials supply depot of the uranium industry in my district—is expending considerable sums of money in their company for research. But I wondered how long they could continue to do that.

Mr. EARNEST. As far as an individual company is concerned I cannot answer. I do not know what they are spending now or how long they can continue.

Mr. EDMONDSON. Have you finished your statement?

Mr. EARNEST. Yes, sir.

Mr. EDMONDSON. Thank you very much for a very fine statement.

Mr. EARNEST. I would like to thank the committee, and anytime that our industry can be of any help to the committee we will certainly be very glad to cooperate.

Mr. EDMONDSON. We will call upon you.

Mr. EARNEST. Thank you very much.

Mr. SAYLOR. Mr. Earnest, I might say that I very much appreciate your coming down here and having given us this general statement and pointing out the fields in which you feel we can be of more advantage to your industry than any others. I for one can say to you that when the time comes that we are to make our further detailed studies, we will be calling upon you again with particular reference to these fields that you have mentioned this morning.

Mr. EARNEST. Thank you.

(Discussion off the record.)

Mr. EDMONDSON. We are very pleased to have with us this morning the Honorable William Pat Jennings, United States Representative from the Ninth District of Virginia. He has coal in his area and a great interest in the future of that coal industry. We are very pleased to have you with us this morning.

STATEMENT OF HON. WILLIAM PAT JENNINGS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VIRGINIA

Mr. JENNINGS. Mr. Chairman and members of the subcommittee, before beginning my comments in support of this study of the possibilities for an expanded program of research and development in the coal industry, as authorized by House Resolution 400, I wish to express my appreciation to the chairman of the subcommittee, Mr. Edmondson, and to the chairman of the House Committee on Interior and Insular Affairs, Mr. Engle, for their promptness in taking action to get this investigation underway. I have been interested in seeing something of this nature started since coming to Congress, and I just want to state that we of the Ninth District of Virginia, and especially those located in the coal-producing area, are grateful.

Also, I wish to commend my colleague from Pennsylvania, Mr. Saylor, for his efforts in behalf of the coal industry.

I appreciate the opportunity to appear here today to express my unqualified support of and interest in the work of this subcommittee. The need for both an "immediate"—and I stress that word—and long-range research and development program in coal has been apparent to those of us concerned with the economy of the coal producing areas of the Nation.

Virginia's bituminous coal production is concentrated in the Ninth Congressional District of Virginia, principally in the six counties of Dickenson, Buchanan, Lee, Russell, Tazewell, and Wise. These counties have all or a part of their economy based on the production of coal. Virginia's production represented approximately 4½ percent of the Nation's output last year, reaching an alltime high of approximately 23½ million tons. Except for a slump in production in the years 1950–54, the Virginia output has grown steadily since the first trainload of coal was hauled from these rich bituminous fields some 70 years ago. Our Virginia coal is of high quality; is easily accessible; located so as to be shipped by rail to the east coast for the foreign market; and also for the domestic market, including the electric utilities, steel plants, and manufacturing plants.

So much for the brief background on Virginia's coal.

The Virginia coal industry, as is true for the rest of the Nation's coal areas, has experienced severe production declines in the years since 1950. The rockbottom was apparently reached in 1954 and recovery started in early 1955, continuing until Virginia 1955 production reached a new peak. These 1955 gains have been continued in 1956, but the future of Virginia coal hinges on the future of the coal industry in the Nation. I feel that you here in this subcommittee are starting the program of research and development that will be needed to keep that future bright and attractive to producers, employees, and the many people who depend on coal to sustain their economy.

I do not intend to take up your time with a technical statement. I know that you have had expert testimony from the officials of the Bu-

reau of Mines and the National Coal Association in regard to the current research programs and what is needed in the future in their estimation. Also, I know that you will receive other expert testimony as you delve deeper into this question of research and development of mining, production, handling, marketing, distribution, transportation, and conventional and new uses for coal. I wish to make 1 or 2 observations which may be of some interest and help to you in gaining an overall picture of the Nation's coal industry at the moment and to see what should be planned.

I am sure that this subcommittee is familiar with the Bureau of Mines Circular 7754, which was issued last month and which lists more than 200 possibilities for research in the field of bituminous coal. It seems to me that this publication gives a very sound basis for a further exploration by the subcommittee into the costs for such research and the bringing into perspective the roles to be played by the Federal Government, State governments, industry, labor, private research operations, and our universities in a massive research venture.

A daily newspaper, editorializing on this Circular 7754, stated that we cannot "wait" for these things (the results of research) to happen. We are advised that the coal industry, and I add, the Government and all other affected and interested parties, must apply themseves to "make" them happen.

In listing some of the major research fields, the editor comments that—

> this only scratches the surface, but scratch we must for the itch of necessity cannot go unheeded.

The editorial ends:

> We will be doing ourselves and the Nation an injustice if we fail to exploit every avenue toward better and wiser use of coal. The sooner an expanded research program begins, the sooner we will reap the benefits.

It is my hope, without taking your time to repeat the various suggestions contained in this circular, that this subcommittee will be able to put us on the road to the goals outlined by the Bureau of Mines and the Bituminous Coal Research, Inc., which cooperated in this survey of research possibilities.

Mr. Chairman, I would also like to leave with the subcommittee a publication of the Virginia Division of Planning and Economic Development entitled "Production and Marketing of Coal in Virginia and the Nation." This publication will be a helpful addition to the other information you have collected.

Also, Mr. Chairman, I have contacted many of the coal operators in my district, explaining the purpose of this investigation. Although the National Coal Association has officially presented the collective views of the Nation's operators, I will make available to you any pertinent information and comments provided by these operators who have evidenced a great interest in this study.

It is heartening, too, to be able to state to you that the State of Virginia has just reorganized its Department of Conservation and Development to include a Division of Minerals. This new division is the logical tie-in with the Federal Government and the Virginia coal industry in any research venture.

This Division of Minerals could also work closely with the excellent facililties found in Virginia colleges and universities, which would be

eager to take part in research of varied nature. For instance, Dr. Walter S. Newman, the president of Virginia Polytechnic Institute, Blacksburg, Va., has already contacted me in regard to any future program. He advises that he will be glad to have his staff members come to Washington to appear before this subcommittee if necessary.

In commenting on the Bureau of Mines Information Circular 7754, which I mentioned a few moments ago, Dr. Newman points out that research on the items listed as well as other projects available will require the cooperative efforts and skills of specialists in the sciences of physics, geology, metallurgy, chemistry, statistics, and the engineering fields of civil, ceramic, chemical, electrical, mechanical, and mining. Virginia Tech, which has well-established and recognized departments in all of these fields with excellent staff members and laboratories, could undertake many of the research projects proposed. It already has underway research projects in the fields of coal mining and coal utilization as follows: In the field of coal as a fuel; as a raw material for chemical and other industries; in the field of production, preparation, mining methods, roof control, and coal recovery; in the field of analysis of coal markets.

I firmly believe that this subcommittee should explore the possibilities of using the potential of our great universities and colleges, such as Virginia Tech. With additions to the staffs and graduate fellowships, many other projects could be undertaken.

Conventional uses of coal should not be overlooked in any recommendations that are made by this subcommittee. New customers are discovering the economy of using coal, particularly the aluminum companies. The industry is returning to coal because equipment is now available to insure top efficiency and keep coal competitive with other fuels—a result of research through the years. It has taken the aluminum industry a half century to come back to coal because of the time required for research and development on coal utilization to produce low-cost electric energy in large quantities and at a price low enough to compete with other fuels and hydroelectric plants. It would certainly be interesting to speculate on whether the aluminum industry would have used coal for the last 65 years if technical progress in coal had kept pace with other developments in the electric power fields.

The coal industry is recapturing the aluminum industry market. I must say that I agree with the recent statement of an aluminum industry official when he declares that other markets can be regained by teaching the country how to burn coal efficiently.

We have a most significant development in my district in connection with the electric utilities in their use of coal. This is in the location of a new steam generating plant practically at the entrance to a coal mine to supply the needed fuel. The electricity generated will be transmitted by high tension wires to the places needed. I believe this plant was mentioned to you earlier this week by the National Coal Association's chairman of the committee on research and development. I felt you might be interested in this advertisement which is appearing in local newspapers throughout the Appalachian Electric Power Co.'s area. This is entitled "Coal by Wire." This company is constructing the steam generating plant just mentioned, locating it near the source of the coal supply and securing sufficient water by using cooling towers. This coal-by-wire plan has tremendous possibilities, and should be con-

sidered in any promotion of the coal industry. I am pleased to see this electric plant go into our coalfields; I have long felt it was the logical move—bringing the plant to the coal rather than transporting the coal long distances to the steam plant.

I will only mention, briefly, my belief that we have only, as the editorialist stated, "scratched" the surface in new uses for coal. Every effort should be made in the fields of coal chemistry, in developing a method to efficiently and economically secure oil and gas from coal, and in the development of other byproducts that are not now in existence. A research program in new uses for coal is all important, but we need considerable attention, also, to the conventional uses in order to regain lost markets and attract new customers.

Briefly, I would like to make these suggestions in connection with your study:

There is a need for every agency of the Government to recognize coal's place in the economy, welfare, and security of our Nation. The importance of keeping our coal industry virile and ready to supply our energy needs should be stressed to the various Government agencies that are concerned with other segments of the economy but which vitally affects coal.

The possibility of curbing the dumping of imported residual fuel oil into traditional coal markets should be studied. Coal has lost portions of its electric utilities market to this waste oil because of the low price that is charged.

The possibility of reducing rail and ocean freight rates so that the overseas market will not be upset. This might also include a study of the overseas market in regard to expanding the market there and to the possibilities of any decline of the increasing availability of petroleum in Europe.

How can seasonal changes in the use of coal by electric utilities be leveled out? At present, natural gas displaces large tonnages of bituminous coal during the nonheating season. Too, thought should be given to conserving gas and oil and using coal throughout the year. Coal reserves are more abundant than our natural-gas supply.

Mr. Chairman, there is also another side to this story that should be given careful consideration. There have been proposals made to spend billions of dollars to build additional atomic electric plants in addition to those proposed under the present program. I am not opposed to the present program of orderly research and development of experimental nuclear powerplants. However, I do not believe we should spend the billions of tax dollars in such a headlong drive for nuclear plants when there is no current need for these sources of electric power. We could best continue our systematic development of nuclear power and use the funds proposed for these additional plants, which would result in high-cost power, for this research and development program in coal. We have abundant coal reserves to furnish low-cost power for centuries to come, and can even provide this coal for those nations that lack such supplies.

And while on the subject of funds for research, the subcommittee's attention is respectfully called to the figures provided by the Bureau of Mines on the amount of moneys spent last year in the United States on coal studies. The figure is small when compared to the total spent in other industries.

I believe, Mr. Chairman, that one of the most important objectives of this subcommittee's study should be the recommending of a coordinating agency, or commission, or bureau, or whatever it may be termed, to bring together the various programs that are now underway in the fields of research and development. This coordinating operation could include representatives of Government, industry, labor, and other interested and affected parties, such as educational institutions. The Bureau of Mines could serve as a focal point for the program envisioned. The coordinating agency could direct the overall research program to avoid duplication of effort, waste of funds, and proper channeling of efforts toward segments of the program that need immediate attention.

For instance, proper attention should be given to research on new uses for coal, but immediate attention would be directed to broadening and improving markets for conventional uses so that the welfare of our employees and producers, and the people who depend on the coal industry, could be assured.

Also, I would recommend to the subcommittee that a plan for a series of research centers, using certain facilities that exist, such as at Virginia Tech mentioned a few minutes ago or establishing new facilities if the need is apparent, should be considered. These centrally located centers could be the salvation of the coal industry, resulting in a strong research program in production, preparation, and transportation of coal with proper emphasis on mining methods and conditions and good conservation practices.

I have always felt that southwest Virginia's coalfields would be a good location for such a center, which could easily serve the adjoining areas of Kentucky, West Virginia, and Tennessee. I would be happy to go into this in more detail if you desire.

Mr. Chairman and members of the subcommittee, the future energy needs of this great Nation can be met by the expansion of the uses of coal. Our energy needs can be met efficiently, economically, and with a minimum cost to everyone concerned, whether it be government or industry. Let us not delay in the development of our coal industry. I believe that if it appears feasible, we should have additional funds appropriated this year for the expansion of our existing research staffs and facilities.

I appreciate the opportunity of expressing my thoughts to you, and I will be glad, if able, to answer any questions.

At this time I would also like to extend an invitation to this committee to hold field hearings in my district, at which time members of the industry, labor, and others affected might have an opportunity to testify and you might have an opportunity to ask questions, which would be of vital importance.

Mr. EDMONDSON. May I say, for my own part, that I deeply appreciate the invitation and also the fine statement which the gentleman has given. I think the project you mentioned in your statement of the company which has located the powerplant upon a coalfield would be one of the things that this committee would be interested in looking at in the course of its investigations in the field.

I want to commend the gentleman for his fine presentation and for the very constructive statement which he has made to the committee.

Does the gentleman from Colorado have any questions?

Mr. ASPINALL. Mr. Chairman, I wish to join with you in complimenting our colleague on his inclusive and cooperative statement.

You draw reference to certain competitive situations, of course, that this committee must take into consideration. Some of us are blessed not only with great coal reserves but with great uranium reserves and with great waterpower. Of course, the committee will have to take all of those angles into its consideration while trying to help one of the really important necessary segments of our economy.

That is all that I have to say.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. I would like to join with my colleagues in congratulating Mr. Jennings on his excellent statement. Of course, when a man makes a statement with which you agree heartily you always like to say a little more about it.

I am also glad, Mr. Jennings, to hear your statement with regard to the expanded experimental use of atomic power for the production of electricity. I think you and I see eye-to-eye in that matter. I have absolutely no objection to their doing some of it, but I think the experimental stations have already been established and any further establishment by the Atomic Energy Commission, unless they can come forward and show it is something new, is an absolute waste of Federal money, and that that money could be expended for the benefit of the people in areas such as you have indicated, in research into the coal fields, and give some to the Bureau of Mines to go into many of the aspects they have not had sufficient moneys to go into before.

I might say that the gentleman from Virginia represents one of the great coalfields of the United States. Some of the area which he represents includes some of the low volatile coals that were referred to here last Monday as being coking reserves and as testified to by the Geological Survey. I know if we go down to the gentleman's district we will have an opportunity to see some of the things that have been referred to here in the testimony.

Mr. EDMONDSON. The gentleman, I hope, realizes that the committee still has some problems, including funding problems, to be solved before we declare any program for investigation in the field.

Mr. JENNINGS. I might say, in that connection, Mr. Chairman, I will be only too glad to lend my support to the securing of those funds.

Mr. EDMONDSON. We will be calling upon the gentleman. Thank you again.

Mr. JENNINGS. I might add also, Mr. Chairman, that the companies involved, namely, the American Gas & Electric Co. and their subsidiary, the Appalachian Electric Power Co., and the Lynchburg Coal Corp. in the Pocohontas field will be glad to cooperate in showing and demonstrating some of the techniques and facilities that are available and need expanding, especially in the generation of electricity located right at the mine site.

Mr. EDMONDSON. Thank you very much.

Mr. JENNINGS. Thank you.

Mr. SAYLOR. Before you adjourn, Mr. Chairman, there are just two questions I would like to ask Mr. Earnest, if he is here.

Can you tell the committee whether there has been any sizable amount of coal that has been lost because of the closing down of mines and the resulting flooding?

Mr. EARNEST. No, sir; there has not been. I think we have been able to handle the orders for all of the market requirements.

Mr. SAYLOR. That is not what I wanted. I know you have been able to supply the market, but has there been any mine that was closed down, ceased pumping operations, had a resulting flooding which might have lost to the country a part of this reserve in the anthracite fields?

Mr. EARNEST. That is going on all the time, yes, sir. There have been a number of them that have been flooded because of just sheer economic reasons the company had to give up the operation.

Mr. ASPINALL. Will the gentleman yield?

Mr. SAYLOR. Yes.

Mr. ASPINALL. The mere fact that they have been shut down and that they have filled up also is causing further injury to those mines which are still trying to operate because more water is going into them, too, and more pumping is required. Is that right?

Mr. EARNEST. That is a very serious problem. When one operation closes down, the water just flows right over to the other. That is right.

Mr. EDMONDSON. I think that is something universally true in mines and certainly a very important point to be made here.

Mr. EARNEST. That is right. In case of emergency it would take in some cases years to dewater those mines and get them back in shape. It gets back to the question I mentioned of productive capacity.

Mr. SAYLOR. That is all.

Mr. EDMONDSON. Without objection, there will be inserted in the record at this point the statement of Hon. James E. Van Zandt, Congressman from Pennsylvania, and a letter from Congressman Harley O. Staggers, of West Virginia.

STATEMENT BY REPRESENTATIVE JAMES E. VAN ZANDT, MEMBER OF CONGRESS, 20TH DISTRICT OF PENNSYLVANIA, BEFORE THE EDMONDSON SUBCOMMITTEE OF THE HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, JUNE 5, 1956

Mr. Chairman, I appreciate the opportunity to appear before your committee in regard to the study you are making on the possibilities of a research and development program for the coal industry of the United States.

As many of you know, my congressional district is located in the heart of the Commonwealth of Pennsylvania and one of the basic industries of our economy is bituminous coal. Another basic industry is railroading, which to a great extent is dependent upon a healthy coal industry.

It is common knowledge that substitute fuels have made serious inroads in the coal industry and as a result my congressional district, like many others in Pennsylvania, has felt the effects of the loss of eastern seaboard coal markets, thus affecting the economy in such a manner that, due to unemployment, my congressional district is classified as a distressed area by the United States Department of Labor.

This committee is to be commended for its study on the possibilities of a research and development program for the coal industry, because, in my opinion, coal will always remain a basic source of energy and heat. In addition, its byproducts have revealed many other uses for coal. However, the surface has been barely scratched in finding new uses for coal, and it is in this particular field that this committee can render a useful service to this great American industry.

According to the United States Department of the Interior, our potential supply of coal is literally beyond the realm of accurate estimate and is so vast that it insures an adequate supply for any reasonable foreseeable period of time. In some quarters it is estimated that we have sufficient coal in reserve for at least a thousand years.

With such a supply of coal on hand, and even though the use of coal for energy and heat will increase many times in the years ahead, there still remains a

pressing need to develop new uses for coal and a more economical means of utilizing it in competition with present-day fuels.

Experts in the field of research and development either have or will appear before this committee. Therefore there is very little I can add except to let you know of the interest of the people of my congressional district in the study that is being made by this committee and to wish you success in your deliberations.

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D. C., June 8, 1956.

Hon. ED EDMONDSON,
Chairman, Coal Research Subcommittee,
Committee on Interior and Insular Affairs,
House of Representatives, Washington, D. C.

DEAR MR. CHAIRMAN: Please let me congratulate you and your colleagues on the subcommittee for the important work that you have undertaken. As Representative of a district where a large proportion of the population is directly dependent upon the coal industry for a livelihood, I am convinced that the investigation which you are now conducting can make an ultimate contribution which will accrue to the benefit of my people and to that of the whole Nation for many years to come.

In the 9 years that I have been a Member of Congress, there has been widespread poverty in our coal communities almost constantly. True, it was in 1947 that the all-time high level of production in the bituminous coal industry was reached, but thereafter a steady decline set in, with nothing to intervene but the short respiratory period accompanying the increase of industrial activity through the Korean war.

We are cognizant of some of the prime reasons for the downward spiral in coal demand. I notice that a number of the distinguished members of your subcommittee are among those of us who have sought for a long time to correct depressed coal market conditions resulting from excessive residual oil imports. There are other aspects to coal's losses which involve competition between domestic fuels; these present controversial issues which have not yet been resolved by the Congress. I am hopeful that through the efforts of this subcommittee such matters will be given sufficient attention as to enable Congress—through legislation, if necessary—to work out a solution that will be beneficial to all industries concerned.

Because the very nature of these investigations will require some first-hand knowledge of the problems confronting the coal industry, I should like at this time to invite you, Mr. Chairman and the other members of the Coal Research Subcommittee, to come into the Second Congressional District of West Virginia for a day, a week, or however long you may wish to remain. No other coal-producing area, save for perhaps the Sixth District of Maryland, which is adjacent to my district but whose coal industry has been almost completely stagnant for a number of years, is so close to the Nation's Capital. In addition, I believe that the Second Congressional District offers as wide a variety of facilities in which this subcommittee would be interested as does any other district in the world.

In the first place, Monongalia County has long been one of the top producing counties in the Nation. We invite you to come into our mines, to talk with our mineworkers and their families. We ask you to see for yourselves how some of our communities depend so heavily upon the coal industry. You will find that many railroad workers rely upon a healthy movement of coal traffic for their jobs. You will discover the extent to which our schools, our police forces, and other local government functions depend upon the prosperity of the coal industry for carrying out their normal activities. You will learn for yourselves that our churches and the clergy cannot properly survive unless the miner and his neighbor are able to make their regular contributions. Those neighbors, I might add, are men who may be employed in local gas stations, in grocery stores, and in other business houses which depend upon the purchasing power of the miner for their own existences.

Monongalia County has many other facilities and operating functions relevant to your study. Witnesses already appearing before your subcommittee have expressed how modernization and mechanization of mines have brought about a decrease in the labor force. Come into our mines and see our drilling, cutting, hauling, roof bolting, and rock dusting machines in action. You will be

thrilled to ride on our electric railway systems that haul the coal for miles. You will see rapid belt conveyors and a variety of other facilities and equipment that will be a novelty to anyone who has not lived in or visited coal producing areas.

Preparation plants costing as much as $2 million are busy getting the coal ready for market. You will marvel at the efficiency of these miracle coal laundries.

Surface mining is another operation which will engage your attention. You have seen photographs of the gigantic draglines and shovels. Come and see them at work in the Second Congressional District of West Virginia.

Heavy coal traffic moves out over the Baltimore & Ohio, the Western Maryland, and the Pennsylvania; in addition both the Baltimore & Ohio and the Western Maryland transport heavy tonnages through this district.

River transportation of coal has grown in importance through the years, particularly with the location of steel mills, atomic energy plants, and now aluminum companies on river sites. The Monongahela River, which flows through my congressional district, is far and away the busiest inland waterway as far as coal transportation is concerned.

The Bureau of Mines Experimental Station in Morgantown is a laboratory which merits a visit from your distinguished committee. We also invite you to visit the coal-mining engineering classrooms at the University of West Virginia in Morgantown. The coal industry must look to a growing number of graduate engineers for its continued progress in the future, and here you will find the finest educational institution of this type in all the world. In addition, I am certain that you would find that our economics department has made various studies from time to time that would be of extreme benefit to this committee in determining the most feasible approach to the accumulation of marketing and distribution data that some of the earlier witnesses have indicated would be desirable for promoting the cause of coal.

Let me point out also that the Olin-Mathieson Chemical Corp., which only recently began operation of an experimental plant engaged in the production of synthetic gas by partial oxidation of coal, is located in Morgantown.

Here you have an opportunity to look into another of coal's potentials from the standpoint of consumption. We also have a variety of other industries which use great quantities of coal annually.

In other words, Mr. Chairman, we have the most modern mines, all forms of transportation, research facilities and an assortment of industrial consumers of coal. Because of these considerations, plus the fact that we are in such close proximity to Washington I feel sure that you and your colleagues will find it advantageous to come into my district for at least a few days in the course of your investigation.

Sincerely yours,

HARLEY O. STAGGERS.

Mr. EDMONDSON. Thank you very much. The subcommittee stands adjourned until 10 o'clock in the morning.

(Whereupon, at 11:55 a. m., the subcommittee adjourned to reconvene at 10 a. m., Thursday, June 7, 1956.)

COAL

THURSDAY, JULY 19, 1956

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE ON COAL RESEARCH OF THE
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The special subcommittee met, pursuant to call, at 9 a. m., in the committee room, New House Office Building, Hon. Ed Edmondson, chairman of the special subcommittee, presiding.

Mr. EDMONDSON. The subcommittee will be in order.

We are very happy this morning to have as our first witness our colleague from the State of Kentucky, one from whom I have heard a great deal about coal and its problems, and I know a man who is deeply interested in the work of this committee. It is a pleasure to welcome Hon. Carl Perkins.

STATEMENT OF HON. CARL D. PERKINS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF KENTUCKY

Mr. PERKINS. Mr. Chairman and members of the committee, I appear here this morning to make some observations concerning the need for a federally sponsored research program for the coal industry. The coal industry is in the strange position of being at the same time one of the Nation's most vitally needed industries and in a most precarious economic position. We all know the importance of coal; economic life in the country would in all probability come to a full stop without coal. It should be self-evident that the industry, which is so important, merits a greater degree of attention to its problems than is the present case.

We all hope that the coal industry reached its lowest ebb in the year 1954. The industry has absorbed and discontinued the loss of two markets which accounted for over one-third of its total coal consumption, the railroad and domestic heating markets. The recovery, which seems to be taking place at this time, has been made possible by three expanding markets. These are steam generation of electricity, increased demands of the steel industry, and foreign exports. The recovery is more apparent than real and is unevenly spread through the industry. Certain mines which are in especially advantageous positions account for much of the current increase in production. Many of the so-called captive mines are booming, in some cases working around the clock. These mines have an assured market, their parent company is demanding an increasing amount of coal. They are those owned primarily by the steel companies and electric utilities. Another group of mines which are experiencing a regeneration of some extent

are those in a particularly advantageous position in regard to transportation. They are located close to centers of consumption or have available low-cost transportation.

By far, the bulk of the coal industry, particularly the smaller companies, constitute another and predominant element. These companies have suffered through a period of dwindling markets and increased costs of transportation. They are leading a hand-to-mouth existence. The area in which they are located are truly depressed areas, depressed in an economic sense and depressed in a psychological sense. They see very little hope for the future under the present conditions. The inevitable, as we see it, long-term growth of demand for the industry's product, will be too long delayed for these thousands of unfortunate people.

Their resources and those of the mining companies upon whom these hundreds of communities must depend are exhausted, they are practically bankrupt. I have for years advocated a better research program and have been hopeful that our Government would recognize the real problem the coal industry has been confronted with. Only a few years ago we witnessed a situation that was disgraceful from the standpoint of the welfare of the coal industry and that was dismantling the coal-to-oil plants near St. Louis, Mo., after our Government had expended more than $75 million on a program that had turned out to be a success. I see in this investigation, now going forward in the House Committee on Interior and Insular Affairs, a glimmer of hope for these people. It is common knowledge and has been for many years that this industry perhaps has suffered more than any other industry because of the lack of a coordinated research and development program. Such a program is a must and an absolute necessity unless we intend to turn our backs on the future. No one would dare question the fact that we must have a strong coal industry in the future. We all know that oil and gas has been bearing too much of the energy burden especially since oil and gas is limited. On the other hand, coal constitutes 90 percent of the Nation's known recoverable mineral fuel reserves.

For the past 10 years many consumers of coal have curtailed their use of coal. Fuel oil, formerly a byproduct, became an increasing competitor of coal for central and domestic heating following the 1931 oil discoveries in east Texas. In recent years, millions of barrels annually have been dumped on our eastern seaboard, primarily from Venezuela, which has had a great impact on the coal industry in America.

We all remember that during World War II many oil tankers were sunk within sight of our shores and coal was called upon to bear the brunt of increased demands for energy and fuel. Just as surely in any emergency of the future, the coal industry will again be called upon. It is the only source of fuel and energy which possesses the elasticity which is so necessary in that event, but this elasticity depends a great deal upon the basic strength of the industry. The stronger and healthier it is the greater its ability to respond to demands in the interest of national survival. This is one of the elementary reasons why we need a coordinated research and development program.

There is apparent in recent reports on the coal industry, a degree of recovery from the low point of 1954. This is more apparent than

real. It is largely confined to a few individual companies in coal-producing areas such as the captive mines. In the congressional district that I represent, for instance, many of the coal mines are small with limited resources. They are at a disadvantage despite the quality of the coal when forced to compete with the larger companies, more advantageously situated. Here, in a relatively small scale, are represented many of the problems that confront the industry on the whole.

These small mines cannot afford the degree of mechanizing that larger mines can. Their costs are somewhat higher. They are not accessible to low-cost transportation. They can sell only at relatively high terminal costs or at an actual loss in competition with other fuels and with companies which are highly mechanized and have access to low cost water transportation. The district that I represent is not alone in its predicament, it is repeated many times over throughout the coal-producing States. And yet it is areas like this which must expand operations in a period of emergency, that must provide the margin of safety in fuel and energy needs.

The 54 percent of total mines producing less than 10,000 tons annually, or the 86 percent producing less than 100,000 tons per mine represent a margin of safety. It is of the utmost importance that these be preserved and strengthened for the future. Means of accomplishing this can only be determined by a thorough program of research.

To lower costs and solve transportation problems for these companies, means must be found to improve production. Consumers of coal in recent years have increasingly required delivery of coal in the form and condition most suitable to their use. This has resulted in demand for cleaner coal and smaller sizes. This requires heavy investments in machinery beyond the ability of thousands of mines. Means must be found to enable the smaller mines to meet these limited conditions.

Progress in the petroleum industry has been due to research.

The coal industry is one industry in which research into all the various aspects of the industry is lagging and at the same time is one where the need is greatest. This is due in part to the fact that at the very time the need for research and development is most apparent, its resources are being strained to the utmost for its very survival. The inroads of competition have weakened the economic structure of the industry to the extent that it is obliged to call for assistance.

The Federal Government has spent in the past and is now spending millions, even billions of dollars in various fields of research. Much of it has been utilized in the interest of industries that are in competition with the coal industry.

The coal industry has lost much of its market in central heating because of the extensive research program of the petroleum and gas industries, and the Federal Government demonstrated its advantages. The soft-coal industry is composed of many small mines and small companies. The largest company produces only 6 percent of the total production, and the top 15 produce no more than one-third. Of the 6,500 mines operating in 1955, over 3,000 mines produced less than 10,000 tons each, a true small-business operation. It is clear then that coal mining is typically a small business. In recent years it has been a very profitable business. Its resources are strictly limited. In the modern competitive business world research is a necessary cost of staying in business, but for the past 30 years, except for the emergency

war era, the coal industry has been unable to finance any considerable amount of research. In 1952, 1,665 coal-mining corporations filing income-tax returns indicated profits averaging just $20,000. One-half of the corporations reports no net income or net losses. It is difficult for an industry composed of so many small units to engage in a small research program no matter how much the need for that program is recognized. Total expenditures for research for the problems in the coal industry in 1955 totaled not much over $17 million, of which the industry contributed $3,658,000; the Federal Government $4,863,000; and State governments, equipment manufacturers, and other industries, colleges, etc., contributed the remainder. This is a poor showing, particularly when compared to research expenditures in other industries. Petroleum in 1953 spent $145.9 million, chemicals spent $361 million, rubber products $53 million.

The United States Bureau of Mines recently conducted a survey of the outlook and research possibilities for bituminous coal. In its report on the survey, it suggested some 209 possible lines of inquiry for a complete program of research for the industry. These range from a more exact determination of the location, extent, and form of coal reserves through mining techniques, preparation, transportation and storage to markets, and new uses of coal. One of the essential elements for the successful program of research is that its beneficial possibilities should be realized. The benefits of research in the coal industry must be made available to all of the members of the industry. A central publications agency should be one of the primary aims of such a program. I suggest that an agency be created, probably within the United States Bureau of Mines, to collect, collate, and publish the results of coal research. To commence a coordinated research program, our Government should appropriate not less than $25 million for this specific purpose.

I feel there is no field in government that needs more attention, the immediate attention of this committee, than what the purpose of this resolution right here sets forth, Mr. Chairman.

That is all I have to say.

Mr. EDMONDSON. You have made a fine statement, and we appreciate it very much.

Are there any questions?

Mr. ASPINALL. No questions.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. I want to thank Mr. Perkins for coming here. I just wondered whether or not he would care to comment—he does not have to—but the thought came to my mind when he spoke of the amount being spent by the oil companies for research—$145 million as compared with $17 million a year by the coal companies—whether or not there was any connection between the depletion allowance allowed for coal of 10 percent and the depletion allowance of 27½ percent of oil with the tremendous expenditure for research. I do not know, but the thought just flashed through my mind.

Mr. PERKINS. The depletion allowance for oil and gas of 27½ percent, of course, has been the law for many, many years. I do not know when the thing was first enacted, perhaps in the twenties, in the tax bill. The depletion allowance for coal up until 1950 or 1952 was only 5 percent instead of 10 percent. It was raised to 10 percent either in 1950 or 1952. But the depletion allowance is out of balance—I can

make that statement—in comparison to oil and gas because you have more overhead as a general rule.

Of course, they base the depletion allowance for oil and gas partly on the fact that you may strike a dry hole, but when you go back into a coal mine you never know how that coal is going to turn out. You do not get an accurate test from core drilling either.

A man can operate a mine maybe 4 or 5 thousand feet underground and make money, and the next 4 or 5 thousand feet he may lose a tremendous amount of money. Sometimes you get back in the mountain around 4 or 5 miles on a good vein of coal and then it turns out that something is wrong and it is not profitable.

There is much argument about leaving the 27½ percent depletion allowance remaining in the law for oil and gas and increasing the depletion allowance for coal. Is that what you had in mind?

Mr. SAYLOR. I just wondered. I did not know whether there might be any connection. I do not know there is. But the thought flashed through my mind that it might be some avenue for this committee to consider.

I am frank to tell you that I never thought of it until you mentioned it in your statement.

Mr. PERKINS. There is one other point I feel I ought to make.

You hear the argument, Why come to the Government for every penny of money that is needed to carry on research today?

If you will look at the profits from the coal industry, you have a few big mines that made money, but they only furnish about 6 percent of the coal of the Nation, and they consume their own coal. I am speaking of the captive mines. They work practically around the clock. But of the other mines about four-fifths are owned by a small group of people and by the little people, we may term it, because the coal operation is largely owned by the little people as a group. If you examine their profits, you find that only a small percentage of them have made any money. The captive mines, of course, have made money, but the majority of the other people have not made any money at all. That is the reason they folded up. They were confronted with all of these problems.

We have no coordinated research program. The department of mines down here can give you a little information on certain phases of the coal industry, but that is all. Then the National Coal Organization can give you a little information about what Pittsburgh Consolidated is doing or something else, but there is nothing coordinated. That is contrasted with the other fuels, where we find they have a coordinated research program.

You do not open these mines up in a month or two. It takes a year at times to pump the water after closing a mine down.

We have got to look to coal in the future. The best waterpower sites of the Nation have already been developed. So we ought to keep the coal industry healthy, and there is just a good chance that we will not keep it healthy unless this committee goes forward with recommendations and we can get them enacted into law.

Mr. EDMONDSON. The gentleman from Montana.

Mr. METCALF. No questions, except to welcome my colleague from the Committee on Education and Labor and thank him for testifying before us. I know in the 4 years I have been in Congress he has always been interested and active in the concern for the welfare of the

coal producers and the coal miners of the country. You have made a fine statement and we are glad to have you before us.

Mr. PERKINS. Thank you, Mr. Metcalf.

Mr. EDMONDSON. The gentleman from Colorado, Mr. Chenoweth.

Mr. CHENOWETH. I want to make the observation that it is a very constructive statement.

I want to comment just briefly on the point my colleague from Pennsylvania made. The problem of the coal industry is not to find new supplies of coal but to find greater markets for coal. There is plenty of coal now but there is no place to sell it. They do not know what to do with it.

Mr. PERKINS. That is right. The problem of the coal industry is finding greater markets for coal. I would say that is the No. 1 problem.

Mr. CHENOWETH. What is the situation in Kentucky on the number of mines today as compared to, say, 25 or 30 years ago?

Mr. PERKINS. You mean?

Mr. CHENOWETH. The number of operating coal mines.

Mr. PERKINS. Fifty percent of the mines that were prosperous 20 or 25 years ago in my district are now closed down.

Mr. CHENOWETH. Fifty percent?

Mr. PERKINS. That is right.

Mr. CHENOWETH. How does the number of coal miners compare today with, say, 25 years ago in Kentucky?

Mr. PERKINS. We have about 25 percent of that number.

Mr. CHENOWETH. What would that be in figures?

Mr. PERKINS. I imagine in the State as a whole we would have about 50,000. In the district that I represent we have about sixteen or seventeen thousand where we did have more than 30,000 when I came to Congress here in 1949.

Mr. CHENOWETH. I think that same situation is true in any coalfield; is it not? I know it is true in mine in Colorado.

Mr. PERKINS. It is so shocking that we have got to look into this with the view of giving the coal industry some assistance, and we can give that assistance through a coordinated research program.

Mr. CHENOWETH. It all boils down to this: that we have lost the market for coal, and unless we can find a new market or a new way to use coal, a synthetic process or otherwise, there is no demand for coal, of course, no work for the miners, and no profit for the mine-owners. The coal industry is at a standstill.

Mr. PERKINS. This is my point. If we proceed along the line of doing nothing like we have proceeded in the last 25 years, except during World War II perhaps, these miners will just continue to be unemployed, and the mines will continue to shut down in the future. At the same time oil and gas will just continue to take over the coal markets. That is what has happened. We lost the heatir g market, we lost the railway market just because we did not have a program, and we are not doing anything about it.

Mr. CHENOWETH. Is not the market for commercial coal increasing and improving right now?

Mr. PERKINS. Yes.

Mr. CHENOWETH. I think we had testimony it was up 15 percent last year.

Mr. PERKINS. That is because of the need for electricity and the need for steel in Europe.

Mr. CHENOWETH. The prospects are brighter today for the coal-mining industry than they have been for some time, are they not?

Mr. PERKINS. But not as bright as they should be.

Mr. CHENOWETH. I do not mean that the problems have been solved. But the picture is improving. I would like to see it improve more.

Mr. PERKINS. We have these experts who say by 20 years from now we will be using a billion tons where we will only mine 550 million this year. That is problematical. But, be that as it may, when we produced 600 million tons before, we ought to be producing 700 million or 800 million today, and I think anybody from the coal industry who has seen us lose all of these other markets will so state.

Mr. CHENOWETH. I am sure the very able chairman of this committee will try to find an extra market for it.

That is all.

Mr. PERKINS. I do not want to leave this committee without congratulating them for going into this problem. It is going to be hard to solve, but I do not know of a committee in existence in Congress that can render greater service to the laboring people and to a basic industry than this committee on a problem that has been so long neglected. It has been neglected all the way along.

I am certainly glad to put in my appearance here this morning. I know you have a problem, and I will lend any assistance I can and cooperate with you on any occasion in the future. Thank you.

Mr. EDMONDSON. We have your invitation to come to your district this fall, and we are trying to make plans for a schedule that will make it possible to visit your district.

Mr. PERKINS. Thank you.

Mr. EDMONDSON. We have representatives this morning of two important organizations in this field. The first representative we have here this morning is Mr. James Mark, Jr., who has with him Mr. James Metz. They are here on behalf of the United Mine Workers of America.

Mr. Mark, I understand you are going to make a statement for the group. We are very pleased to welcome you here this morning. I have a lifelong friendship with one of your stalwart leaders down in Oklahoma, Mr. Dave Fowler, for whom I have a very high regard.

We are very pleased to welcome you to the committee this morning.

Mr. MARK. Thank you.

Mr. SAYLOR. Before Mr. Mark begins his testimony, Mr. Chairman, I would like to say, while he may seem young in years, he is old as far as experience with miners and mining is concerned.

His venerable father was one of the outstanding organizers for the United Mine Workers for many, many years, was president of district No. 2. The gentleman before us in the witness chair today has grown up in the field of coal, both from the producers' and from the labor side of the picture. I know of no one man on Capitol Hill that is in a better position to give some testimony to this committee.

Jim, it is a pleasure to have you here this morning.

STATEMENT OF JAMES MARK, JR., REPRESENTING THE UNITED MINE WORKERS OF AMERICA

Mr. MARK. Thank you, Mr. Saylor. I might just amend that to say he feels old in years, too.

I am very happy to appear before the committee in behalf of Secretary-Treasurer John Owens, who regrets he was unable to make his appearance. I have a prepared statement as prepared by Mr. Owens which I would like to read, and I will be available for any questions.

The work assigned to this subcommittee relating to coal research is extremely important, not only to the coal industry and the communities and States in which coal is mined, but it has a direct relationship to national defense and to meeting the needs of our Nation and our allies in the event of a national emergency.

The first day after the last world war started we were on a coal economy, not only as affecting our own Nation, but that of our allies as well. The same would be true in any future emergency. Without Government help during the last war the coal industry arose to great new heights in production and we were able to supply our own Nation's needs, as well as those of our allies. Building up our potentials in the coal industry is, therefore, of the utmost importance and the work of this committee, in our judgment, could contribute greatly to the coal industry and to the Nation in building for the future.

In the 80th Congress, the Committee on Interstate and Foreign Commerce made a statement that is even more pertinent today than it was then. The committee stated that—

> so far as our national economy and our national security are concerned no problem looms larger than the question of the adequacy of our energy resources.

Later in that report the committee again stated:

> The preservation of existing facilities and the consummation of the large expansion contemplated may be accomplished only if there is peace in the Middle East. The gravity of the situation and precariousness of the potentialities of this area as a source of supply have been presented to this committee in testimony.

I submit, gentlemen of the committee, that these same vital conditions prevail today, even more so than then. There is trouble and dissatisfaction throughout the Middle East which grows more alarming with each day that passes. It is the considered judgment of the United Mine Workers of America that the Government should once again open its synthetic liquid fuels program to produce synthetic liquid fuels from coal, oil shale, agricultural and forestry products, and other substances. There are many new formulas for the production of synthetic fuels from coal and oil shale, for the coking of anthracite and soft coals which, if properly pursued, might make this country independent of foreign sources of supply should they be cut off by war or foreign intrigue.

If, as the Appropriations Committee suggested at the time the Government program was curtailed, we have proceeded far enough with the Bureau of Mines experimentation with the old European synthetic fuels developments, then I think it would be well for further experimentation with the Harman and Singh processes, and the one-step process mentioned in their report, of which there has been no further mention.

I wish to call the attention of this committee to a statement made during the war by a House Armed Services subcommittee which, I think, is as applicable today as it was then. The committee said:

> We want to give expression, frankly and without equivocation, to our view that the Nation is already guilty of half-hearted action in dealing with petroleum; that as a nation we are living profligately today in our use of petroleum products; that we are providing inadequately for national defense at a time of great international tension; that early action is imperative, on a national scale, unless we wish to continue to jeopardize the national safety and render future generations in this great country hostage to our own profligacy.

I could hope that this committee might be able to have before it the inventors of the many new experiments for extracting synthetic fuels from coal and for coking anthracite and the softer bituminous coals. I am sure you would find their testimony extremely interesting.

In many sections of the coal-producing centers we are confronted with a great deal of chronic unemployment which has prevailed for a considerable period of time. Surplus labor areas are very pronounced in the anthracite coalfields such as Scranton, Wilkes-Barre, Hazleton, Pottsville, and Shamokin, Pa. Surplus labor areas are prevalent likewise in many sectitons of the bituminous coal regions of Colorado, Illinois, Indiana, Kentucky, Montana, Ohio, Oklahoma, Pennsylvania, Utah, and southern West Virginia. Increased productivity and increased uses for coal through the help of your committee could very well result in stabilization of employment in these sections.

Without being accused of submitting material that is not germane, I think it is proper and I wish to reiterate what has been said on numerous occasions before various committees of the House and Senate by International Vice President Thomas Kennedy, United Mine Workers of America, that pending the bringing about of stabilization in the surplus labor coal areas, some consideration should be given to the possibility of the payment of unemployment compensation to idle persons during the period of their unemployment and should not be restricted to the 26 or 30 weeks now provided for by legislation.

Getting down to the subjects relating to coal which will be handled by your committee, I might point out that the first seven objectives deal with the practical aspects of the coal industry such as mining coal, preparation, handling, marketing, distribution, transportation, and conventional uses. The other seven objectives set out by your committee deal with technical and chemical problems as affecting the coal industry. These technical and chemical problems will be handled by men from the coal industry and the United States Bureau of Mines who are fully capable of doing so.

The United Mine Workers of America, in this paper, will attempt to deal only with the practical problems and, in this connection, we would advise that there are very few difficulties with respect to the mining of coal. The mining of coal is now on a very efficient and highly productive basis. Productivity has been rising in both the bituminous and anthracite regions and is continually being increased. The one outstanding problem in mining is, of course, the safety question which seems to be always with us. Up until December 1955 the United Mine Workers of America, the industry, the Federal Bureau of Mines, and various State departments of mines have been cooperating better than ever before in seeking to bring about greater safety in the mining of coal. However, the failure to name a Director for the Bureau of Mines

who is interested and in complete charge of the enforcement of the mine safety laws has resulted, we believe, in a lack of discipline and a general letdown in the field.

May I just digress for a moment to say that on yesterday the Committee on Interior and Insular Affairs of the Senate voted confirmation, or to report the name of Marlyn J. Anthony to the Senate body to be the new Director of the Bureau of Mines.

With regard to preparation, many plants are now in operation and others are rapidly being constructed throughout the industry so as to give the consumer the type and quality of coal that is necessary. The handling, marketing, and distribution of coal is likewise being put on a more efficient basis. Insofar as transportation is concerned, there has been a decided car shortage on many railroads, and on this subject the special committee on car supply of the National Coal Association no doubt can give full particulars to this committee. However, this is a serious problem and we believe a good subject for congressional investigation.

On conventional uses, it seems to us that this point is related to the mining, preparation, and marketing of coal. There is demand for coal for household use, in apartments, hotels, and in the electrical emergency in the aluminum fabricating and steel industries. In this respect, the industry is adjusting itself to these various conventional uses and will undoubtedly be able to meet any demand such uses might require.

With respect to another point in relationship to uses, we would point out that there is a potential market in Europe and Asia for at least 50 million tons of coal per year and this market can be built up and maintained through proper and equitable offshore transportation. There is little likelihood of production of coal being increased in Europe. Mostly all countries are producing per man per day not more than 1.25 tons of coal; on the Continent tonnage produced per man per day is less than 1 ton. Therefore, this enlargement of a market for American coal is not in the offing but is really here and is now a possibility that can be realized through proper adjustment of matters related to exports.

There are great possibilities in the technical and chemical fields which will be handled by others before your committee. The United Mine Workers of America reiterates its approval of the scope of work by this committee and we offer you our continued cooperation and support in the hope that concrete procedures might be advanced which can be put into practical operation and which will be in keeping with the purpose of this coal study. Furthermore, we hope they will be of great advantage to our Government, to the industry, to the communities and to the employees affected by the basic coal industry which will continue, in our judgment, to be the basic source of supply for energy in our world economy.

Mr. EDMONDSON. Mr. Mark, that is a very fine statement. You have pointed, I think, to several new ideas, for me at least, in the field of investigation by this committee.

One thing I was interested in was your remark there is need for proper adjustment of matters related to export. Do you have something in particular in mind along that line?

Mr. MARK. I refer there, Mr. Chairman, to the freight rates now in existence. Practically 100 percent of the coal that is carried into

foreign ports is carried by ships usually owned by the Greek shipping outfits. They are foreign bottoms, manned by foreign sailors. Their rates of shipping fluctuates with the demand over there. As the demand increases, their shipping rates go higher.

The rate presently is about $10.60 a ton from Tidewater, Va., to Duesseldorf, Germany. But that rate 3 or 4 weeks ago before there was some talk of us starting an American shipping company was $12.50 a ton, and it has been as high as $18 a ton.

So that the foreign market will not make long commitments on tonnage of coal to American producers unless they can get a stabilization of that shipping rate. That was the reference I made to adjustment.

Mr. EDMONDSON. The gentleman from Colorado.

Mr. ASPINALL. Mr. Chairman, I would join with you in the thought that this is a fine statement from the United Mine Workers. It is concise and constructive.

Mr. Mark, when Mr. Owens prepared the statement and quoted from the statement of the House Armed Services Committee, which quote, among other things, carries the thought that as a Nation we are living profligately today in our use of petroleum products, do you know what Mr. Owens had in mind when he used that statement? Was it the thought that we are using too much of our petroleum products at the present time, that we are wasteful in the use of them? Or is it a question of balance between the different kinds of petroleum products that he had in mind?

Mr. MARK. Mr. Aspinall, I would like to connect the question that Congressman Chenoweth asked Congressman Perkins from Kentucky with that. I think what Mr. Owens had in mind was the fact that for years we have been burning oil industrially under boilers. We in the Mine Workers do not feel that that is something we should use oil for, knowing that if there is any kind of a stoppage of our shipments of oil from the Middle East and the southern countries that we are going to have a shortage of oil. During the war the people who burned oil in their own heaters at home, in their own furnaces, were rationed. We think that burning coal for oil industrially—and that is residual oil, waste oil—is a problem for the coal industry. It is more efficient, it is cheaper if we have to compete with our own American markets.

I think that he had in mind the fact that on foreign ships, foreign bottoms, manned by foreign labor, they are bringing not refined oil but the waste oil products of the Arabian oilfields over here and dumping it on our eastern seaboard at $1.05 a barrel. It takes 4.7 barrels of oil to meet the equivalent of 1 ton of coal. You can readily see that the coal industry nor the American oil industry, which is largely independent, can compete with that particular price. I think that is what Mr. Owens had in mind—that we are wasting that oil.

Mr. ASPINALL. In other words, it is not a question of being profligate, perhaps, it is a question of not being intelligent?

Mr. MARK. I think it is a maldistribution at our markets, and that is the thing that I wanted to say to Mr. Chenoweth. It is not a case of finding new markets for coal. Here we have known deposits of coal to serve our Nation for some 3,000 years at the rate of a billion tons of coal a year, but we are not utilizing it.

Our independent oil refiners cannot get rid of their own residual oil to take its regular place in the market. They have to store it.

They have a quota system in every oil-producing State in this country where they can only produce a certain number of barrels a day.

Mr. ASPINALL. The known reserves of oil are somewhat less than 20 years, as far as figuring on the present usage. Is that not right?

Mr. MARK. Geologists have made that statement.

Mr. ASPINALL. In our own Nation?

Mr. MARK. In our own Nation. Of course, oil and gas are a mobile product underground, and I do not believe that you can adequately state that we have 20 years, or 10 years, or 15 years, or 30 years.

The oil industry has in the past been discovering new fields almost equivalent to that which has been used in the previous year.

I think conservation of oil is a good thing, because during World War II, if I remember correctly, or the First World War, we were getting our oil from Venezuela, which is very close by, and I think many of the tankers that shipped out of there arrived on these ports.

Mr. ASPINALL. Of course, I do not know whether you are bothered about the fact of the ultimate use of our natural resources, or whether you are bothered about the fact of wise, intelligent balancing of the use of our natural resources. It makes no difference where these natural resources come from, or whether they are used from our stockpile. What I am more interested in than anything else, is the wise use of the different kinds of these natural resources in producing resources presently, rather than the use of one exclusive of the other. Is that the approach?

Mr. MARK. I think we are bothered about the same thing. I think the wise use of our natural resources and the balance of the use of our natural resources go together, if you take into consideration our own economic preparedness.

Mr. ASPINALL. Why is it that you would rather have coal used than oil at the present time?

Mr. MARK. I think in time of war we need oil. We cannot burn coal in airplanes.

Mr. ASPINALL. In other words, the motivating reason for your appearance here this morning is to help bring about a situation where it is just as economical to produce needed energy and products from coal as it is oil. Is that right?

Mr. MARK. That is true. That is true, Mr. Congressman.

Further than that, we have always felt that this country should have a fuels policy which would serve it in time of peace—equitably well balanced and wisely used, considering conservation for time of war and the defense of our country.

Mr. ASPINALL. Rather than the primary reason of making it possible for people whom your organization represents to have employment at the present time?

Mr. MARK. The employment problem in the coal industry, while employment is presently down, is not such a huge problem. The production per man per day of the American miner has gone up to where it is now 10.8 tons per day.

Somebody asked the question about 25 years ago, and they were relating it to the State of Kentucky. I would like to give you the overall figures.

Twenty-five years ago we mined about 480 million tons of coal a year. We had 483,000 coal miners underground. Today we will

mine close to 500 million tons of coal, or 450 million tons of coal this year, with 285,000 coal miners.

So we are a victim in unemployment, not only in the taking over of markets by residual oil, but we are a victim of automation, if you want to call it that, because the coal industry is now a source of labor for highly skilled men, and the working forces have been reduced as productivity has increased. We think that is the thing that should be done in industry.

Mr. ASPINALL. I think that is right. However, as a member of this committee, I do not want to get caught in cross-currents between the production of petroleum products, especially from our oil reserves, and the production of coal for any particular reason. I can see where it is necessary for us to develop our oil reserves to have them present in time of international stress and strain, just the same as it is our coal reserves. Perhaps we should develop them and have them ready for production if that time comes.

Now, private industry is not going to do that development unless it has a chance to find the market while it is developing it. Is that right?

Mr. MARK. I agree with that 100 percent.

Mr. ASPINALL. And the reason now for this program and this move to help the coal industry is not especially to get it into any kind of unfair competition with an existing industry. That is correct, too; is it not?

Mr. MARK. That is true. I think the unfair competition would be on the other foot, though.

Mr. ASPINALL. I am not designating that one way or the other.

Mr. MARK. I understand that.

Mr. ASPINALL. In this statement Mr. Owens asks for a continuation of a research program such as that we had under the O'Mahoney-Wolverton Act, I believe it was.

Mr. MARK. That is correct.

Mr. ASPINALL. How far does the United Mine Workers wish to go in that program? Do you wish to stop at a laboratory research program that is now in existence? Do you wish to stop at the pilot plant which is used at the present time? Or do you wish to continue with the demonstration plants which the O'Mahoney-Wolverton Act authorized?

Mr. MARK. I think we would wish to continue with the demonstration plant. We would wish it on the basis now, Congressman, that we testified before the O'Mahoney committee, that we feel that this Nation should have a fuels policy that is adequate.

Mr. ASPINALL. That brings the next question. When you testified before that committee you testified in favor of the appropriation that was placed on that legislation at that time, did you not?

Mr. MARK. We did.

Mr. ASPINALL. When you testified, did you have in mind that that amount of money would do the job, or that that was the beginning of a program?

Mr. MARK. We felt at that time that the industry itself did not have the capital to conduct its own experiments, that the Government would experiment through these pilot plants eventually until industry could see where they could put the extraction of oil from coal on a marketable basis.

Mr. ASPINALL. At that time the coal industry was in pretty good shape, at the close of the war?

Mr. MARK. They were in pretty good shape, momentarily.

Mr. ASPINALL. But the oil-shale industry was in no shape at all as far as an economic industry was concerned. That is correct, is it not, in the United States?

Mr. MARK. That is correct.

Mr. ASPINALL. Could you tell us what has happened in the last 4 or 5 years—I do not begin with 1953, I begin before 1953—what has happened to draw off the enthusiasm for the demonstration plant research program in the United States?

Mr. MARK. I cannot give you the exact reasoning. Of course, we attribute it to the Interior Department's ex-head, who is now running for the Senate in Oregon. We think that he did not like that kind of program. We called it his giveaway program. He closed down the research programs on those.

Mr. ASPINALL. Mr. Mark, do you not have to go further back than that, though?

Mr. MARK. I suppose there are a lot of things, Congressman, entering into that picture, which I do not know.

Mr. ASPINALL. You answered my question that, as far as the program of research is concerned, you testified for it. While the coal industry was primarily involved, oil shale was also involved, and you answered my question that the reason for it was the national defense program.

Mr. MARK. That is right, and we did not differentiate in our testimony between coal and oil shale.

Mr. ASPINALL. I understand that.

Mr. MARK. We also testified for the appropriation for the oil shale.

Mr. ASPINALL. I understand that. If that same motivating thought was behind some of the competitors of this production of the natural resources that you are speaking about, do you think that we would have had a closing down of the pilot plant, demonstration plant program?

Mr. MARK. We have had a closing down.

Mr. ASPINALL. I did not ask that. I said, would there have been if they had had the same approach to the national defense program you have?

Mr. MARK. No; I do not think we would have.

Mr. ASPINALL. That is all.

Mr. EDMONDSON. Mr. Saylor?

Mr. SAYLOR. I might say, Mr. Mark, I am delighted with your being here. I might tell you that every time I thought of a good question and made a note of it, Mr. Aspinall took it right out from under me. I congratulate him on his interrogation because he has developed a number of points I had marked here to bring out.

One of the things that I have heard criticized as far as the demonstration plant was concerned on the oil shales, or the synthetic process that was, in effect, built after World War II, is that it was not truly research, that all it was proving was that what had kept Germany operating for the last several years of the war, if duplicated in the United States, could produce synthetic fuel here, could produce oil here.

Mr. MARK. I think that is right, Congressman. I think that presently we have some more modern methods of extraction that have never been gone into—the liquification of coal by the Harman-Singh process, where they can control the ash content, the sulfur content of the coal, and taking the byproducts out, and produce from even an inferior grade of coal, such as you have in Colorado, a coking coal, if you please.

We have not gone into this particularly.

Mr. SAYLOR. In other words, the kind of program that you are recommending would go beyond what we had before, and would actually go into true research; and if this Harman-Singh method was used or proved out, it might lead into still other fields?

Mr. MARK. That is true.

Mr. SAYLOR. That is the kind of research that you are recommending this committee investigate and, if we find it to be proper, to recommend to the Congress for an appropriation?

Mr. MARK. That is true, Congressman.

Mr. SAYLOR. So if we do a job, it will be the overall picture of what uses coal can be put to, what uses oil shale can be put to, and cover the whole panorama of derivative products?

Mr. MARK. That is true. And I would not eliminate some agricultural products in there.

Mr. SAYLOR. That is all, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Colorado, Mr. Chenoweth.

Mr. CHENOWETH. Mr. Mark, I want to commend you for a very fine statement. I have been very interested in your comments.

Going back to your reference to the statement of Mr. Perkins on the question I asked him about the decline in the market for coal, we must recognize that there are certain markets for coal that are lost forever, and there is no research, there is nothing anyone can do about it.

Take the railroads, for instance. I was born and raised in southern Colorado, in the heart of that coal field. I have been acquainted with the coal-mining industry since I was a boy and a young man, and I have had many friends in the industry. I know a little bit about it. I have seen those mines in my own country decline from possibly 40 good-sized mines to 2 left now. They are owned by the Colorado Fuel and Iron Corp., and they use the product for coking coal at their steel plant at Pueblo, Colo. If it were not for that demand, I do not know of any mine that would be operating.

The Santa Fe Railroad used to take the entire output from a mine, the Rock Island Railroad took the entire output from another mine, and also the Colorado and Southern Railroad. The Union Pacific Railroad in Wyoming have their own coal, and they are going now, I think, to diesels. That market is gone. There is not much we can do about it. They will never use coal again. I think they are going to diesels permanently. Is that not your impression?

Mr. MARK. Let me say, Congressman, it is presently gone. But let me go further than that.

There is in construction now a coal-burning locomotive that generates its own electricity; so it will be actually an electric locomotive, which is more efficient per ton per mile haulage than diesel. So, therefore, that will come back.

The volume of air conditioning and electric heating is increasing every day, every month of every passing year. Where you formerly heated your home with coal, and you do not any more, now you are going to get that coal by wire, because your electric utility company is using so much more coal to produce so many more kilowatts of electricity.

I think Mr. Saylor made the statement here that some of the coal experts fully expect within the next decade to mine a billion tons of coal a year. I fully think that will be done.

Mr. CHENOWETH. How much?

Mr. MARK. A billion tons of coal a year.

Mr. CHENOWETH. And what is the figure today?

Mr. MARK. The highest we have ever mined was 680 million tons during World War II.

Mr. CHENOWETH. You quoted some figures a moment ago.

Mr. MARK. We had 450 million tons this year.

Mr. CHENOWETH. You compared it with 480 million, I believe. What year was that?

Mr. MARK. That was more or less of a standard production. We did not use all of that coal, but we produced throughout the years between wars about 480 million tons of coal a year.

Mr. CHENOWETH. Going back 30 years, would you say that was standard production, that we are only down 30 million tons?

Mr. MARK. No; 30 years ago we did not produce that. But, you see, the energy consumption requirements of all energies have been steadily increasing, and, of course, the coal produced by the mine workers has been taking a share of that, but a lesser share. At one time we supplied through coal about 58 percent of all the energy used in this country.

Mr. CHENOWETH. What would it be today?

Mr. MARK. It is now in the forties. I would not care to quote an exact figure, but it is down in the forties.

Mr. CHENOWETH. The number of coal miners is declining constantly; is it not? You quoted some figures a moment ago.

Mr. MARK. Twenty years ago we had 483,000 coal miners. This year we will produce 450 million tons of coal with 285,000.

Mr. CHENOWETH. It is down about 200,000?

Mr. MARK. Yes.

Mr. ASPINALL. Will the gentleman yield?

Mr. CHENOWETH. Yes.

Mr. ASPINALL. The reason for that is not the closing down of mines, but the reason for that is the mechanization used in the mining of coal?

Mr. MARK. That is true, the increased production per man.

Mr. CHENOWETH. I am not so sure of that. I do not think that is the entire cause. In Las Animas County where I live the Colorado Iron & Fuel Corp. has the Allen mine, which they claim is the finest, most highly mechanized mine in this country. I think they employ five or six hundred men in that mine today. Within a few miles from there they have an old mine, the Valdez mine, that has been operated for many years, where I think they employ about 700 men.

So this mechanized mine is using pretty close to the same number of men they use in the old mine where they do not have modern machinery and methods. Apparently they require quite a few men to operate these mechanized mines.

Mr. MARK. Let me give you a practical figure on mechanization of mines, Congressman. Ten years ago, on what we call the cleanup system of mining, 22 men would go in and drive a heading, and they would mine at that time about 5.6 tons of coal per day.

Today 3 men will go in there with machinery and drive that heading and average 50 to 75 tons of coal per day. The industry as a whole is around 20 percent fully mechanized, about 40 percent partially mechanized, and only about 28 percent which is still on the hand-loading basis. Of course, the mean average is taken from all of those.

Mr. CHENOWETH. The mechanization of the mines will continue, will it not?

Mr. MARK. It is the hope of the United Mine Workers it will. We have always been for mechanization and always will be.

Mr. CHENOWETH. And this substantial decline in the number of coal miners in this country is more directly due to the loss of markets for coal, than the mechanization of coal mines; is it not?

Mr. MARK. No, I would not say that. When you compare, as I said, 22 men driving a heading to 3 now who are increasing 50 times the amount of tonnage taken out on an 8-hour shift, I think that has a big effect.

Mr. CHENOWETH. I think in my own area in southern Colorado——

Mr. MARK. In the Colorado fields, I think you are just getting into mechanization. You are not anywhere near fully mechanized.

Mr. CHENOWETH. I think this one mine is the only fully mechanized mine there.

Mr. MARK. When you speak of fully mechanized mines now, you are talking about mechanization to the extent that you have joy loaders, probably belt transportation instead of car transportation, which takes away your haulage men. But when I am speaking of fully mechanized mines, I am talking of the ground mole that goes under with three men and does all of that work.

We have only one mine in the country, I think, fully mechanized, and that is down in West Virginia.

Mr. CHENOWETH. I am not an expert in the technical parts of the mechanization of coal mines.

Mr. MARK. I have never claimed to be an expert, and never hope to.

Mr. CHENOWETH. This Allen mine of the Colorado Fuel and Iron Corp. is looked upon as more or less a modern mine.

Mr. MARK. I think they probably have belt transportation and joy loaders. It requires 4 or 5 men to run the loader, and it requires men to take care of the belt transportation, where the coal is loaded on to the belt and brought to a heading, and probably from there a shuttle car takes it out to the tipple.

Mr. CHENOWETH. What concerns me is the large number of coal mines, some of them good sized that have been abandoned. They are gone. I have seen whole communities go. In one particular area 3,000 residents. It is gone completely. There is nothing there. Large coal mines have been completely abandoned.

That is what concerns me. That is the reason I am interested in the work of this committee.

Is there anything we can do to bring back the industry? I would be interested in seeing what your observations are on what could be

done. It is obvious some of the markets are gone. What are the markets available?

Mr. MARK. Largely utilities. But I think some of the markets can come back.

I do think, and I know that Mr. Lewis thinks, very definitely, that through the processes of extraction of oil and gas from coal and the utilization of byproducts, that you get in your synthetics, drugs and cosmetics, and various other fields—there are some 56, I think, by-products, and the tapering off of the waste product that is coming in here—that the market for coal is here for expansion. It will probably reopen some of the mines now abandoned.

Mr. CHENOWETH. It is very difficult to open a mine, is it not, after it has been abandoned?

Mr. MARK. It is extremely expensive, Congressman.

Mr. CHENOWETH. I appreciate the opportunity to question you, Mr. Mark. I have been very much interested in your observations. Thank you very much.

Mr. EDMONDSON. Just to complete the picture on this labor aspect of present-day mining production, Mr. Mark, in the figures you gave for 20 to 25 years ago, and today, how does the average length of the working day compare today with 20 or 25 years ago in the mines, counting in the average overtime that would be worked today with 20 or 25 years ago?

Mr. MARK. The average work day is 7 hours and 45 minutes today. There is a 15-minute lunch period in that time. Twenty-five years ago a man entered the mine before sunup and he came out after dark. There was not a set hour. You worked as long as the company wanted to load cars for tomorrow's orders. The average day was from 12 to——

Mr. ASPINALL. I think this is one of the great contributions the United Mine Workers of America has made to the welfare of the industry.

Mr. MARK. Thank you, Congressman.

Mr. EDMONDSON. The reduction in working day, then, would you say, has been as much as 40 or 50 percent?

Mr. MARK. 40 percent, anyhow.

Mr. EDMONDSON. How does the average hourly rate of pay compare today with what it was 20 or 25 years ago?

Mr. MARK. You would almost have to take the daily rate of pay to match the hourly rate of pay today, and then I do not think you would quite make it. I remember my father shoveling coal back in the thirties with a pitchfork, so he would not get any slack in it, and he got about $1.25 a day for that.

Mr. EDMONDSON. What is the average hourly rate of pay today?

Mr. MARK. I can give you the exact figure later on. It runs from $2.45 or $2.61, I think, hourly; I can give you the exact figure, if you would like to have it, for the committee record.

Mr. EDMONDSON. In the thirties, were they on an hourly rate of pay or a daily rate of pay?

Mr. MARK. A daily rate of pay.

Mr. EDMONDSON. I would like to join my colleagues in saying you have made a very constructive contribution to the committee. We appreciate very much your being here and appreciate your being with us, Mr. Metz.

Mr. CHENOWETH. Mr. Chairman, I would like to ask one further question.

I notice you refer to the safety situation in coal mines. Have they not made great progress and great strides in safety in coal mines?

As I compare the picture in Colorado now with what it was some years back, it looks like we have certainly gone a long way in improving the safety of the coal mines.

Mr. MARK. I am very happy to agree with you, Congressman.

Since the adoption of the Federal Mine Safety Code and the Federal Government giving Federal mine safety inspectors the right to go in the mine and enforce their findings, there has been a continual drop-off in the accident and death rate of the mining industry. That was true up until December 5, when we had no head of the Department of Mines. The Director of the Department of Mines is necessarily the Director of the Health and Safety Department, and the field agencies kind of laid down on the job, and the death rate and the accident rate kept mounting. We hope now, through the action of the sister committee in the Senate, that that will be wiped out with the appointment of Mr. Anthony as Director of the Bureau of Mines.

Mr. CHENOWETH. Have not the States themselves, independent of the Federal inspection, done a pretty good job?

Mr. MARK. The States have, after the Federal board was set up. I understand you had a lady in your State at one time who was director of the State bureau of mines.

A woman as director in Colorado. I may be mistaken on that.

Mr. CHENOWETH. I do not recall.

Mr. ASPINALL. Do you mean Josephine Roche?

Mr. CHENOWETH. I do not recall she was director. She was a coal operator there and was very much interested in coal mines. Josephine Roche had some mines in my area.

Mr. MARK. No; that was not Josephine Roche. I think in recent years you had a lady director of the bureau of mines.

Mr. CHENOWETH. Mr. Allen is director now.

Mr. MARK. I know he is now.

Mr. CHENOWETH. And Mr. Dahlrymple was before him. Maybe my colleague, Mr. Aspinall, remembers someone else.

As a young man I remember some disasters, mine explosions in southern Colorado where large numbers of coal miners lost their lives.

There was a succession of those. There was one in Dawson, N. Mex., I recall; and a number in southern Colorado.

But we do not have those any more. I think someone is entitled to great credit. I think the United Mine Workers, along with others, are entitled to great credit for bringing about this change in working conditions.

Mr. MARK. I think it is commendable to the industry as a whole, the working force and everyone else.

Mr. CHENOWETH. Yes; I do, too.

Thank you very much.

Mr. MARK. Thank you.

Mr. SAYLOR. I would like to say for the benefit of Mr. Chenoweth and members of the committee, that one of the first real battles I ever got into down here in Congress was on behalf of the mine safety bill in the 82d Congress.

Mr. MARK. That is right.

Mr. SAYLOR. I know that everybody here was for it when the final chips were down.

I think it was a proposition of, even though certain States might have had some good laws on their books, that merely placing them on the books was not sufficient, that the actual enforcement of them is the thing that makes a law useful, or beneficial to the people whom it is intended to benefit.

It was not until the actual Federal mine safety law was passed by the 82d Congress that the cooperation occurred between the States and the Federal authorities, tending toward the safety of the men who work in the mines.

I know it has been my privilege to discuss the matter, not only with the miners, but with many of the operators, and the men who I think are the leaders in the coal mining field, as far as production is concerned, have told me that one of the best things that ever happened, as far as they were concerned, is the passage by the 82d Congress of the Federal mine safety bill.

Mr. MARK. I am sure the Congressman is right.

Mr. CHENOWETH. I would like to commend my colleague from Pennsylvania for his interest in that legislation. I was a Member of the 82d Congress, and I supported that bill. I think everyone was very happy the way it has worked out. In Colorado I have not seen any complaints. Everyone is very pleased over the cooperation.

Mr. MARK. I would just like to say, Mr. Chairman, that during the Krug administration in the Interior Department, he one time proclaimed there were only two safe mines in the United States, and I think both of those were in Colorado.

Mr. EDMONDSON. Thank you very much, Mr. Mark.

Mr. MARK. Thank you.

Mr. EDMONDSON. The next witness is representing the Coal Division of the American Mining Congress, and consultant of the Pittsburg and Midway Coal Mining Co. of Pittsburg, Kans.

Mr. Schroeder, we are very happy to have you with us here this morning. We know the great contribution of the American Mining Congress in this field, and their study of the problem.

We will be glad to hear from you.

Mr. ASPINALL. May I take the time to welcome the doctor to the committee. Dr. Schroeder has been before this committee in years past, and had a great deal to do with the synthetic fuels research program several years back.

It is very nice to have you here, Dr. Schroeder.

STATEMENT OF WILBURN C. SCHROEDER, CONSULTING ENGINEER, COLLEGE PARK, MD., REPRESENTING THE AMERICAN MINING CONGRESS

Mr. SCHROEDER. Thank you, Mr. Aspinall.

Mr. Chairman and members of the committee, and gentlemen, I have a prepared statement here. I think probably you have copies of it. If it is agreeable to you, I will talk generally from that statement, and not attempt to read all of it.

Mr. EDMONDSON. Without objection, the statement of Dr. Schroeder will be admitted at this point in the record.

(The statement referred to follows:)

TESTIMONY ON HOUSE OF REPRESENTATIVES RESOLUTION 400—A STUDY LEADING TO THE ESTABLISHMENT OF A RESEARCH AND DEVELOPMENT PROGRAM FOR THE COAL INDUSTRY

W. C. Schroeder[1]

The Pittsburg & Midway Coal Mining Co. and the coal division of the American Mining Congress welcomes the interest and attention of Congress not only to the problems of the coal industry, but to the possibilities for development as well. The coal industry has been buffeted by strong and often adverse currents during the past 15 years but still emerges as a healthy and growing industry, able and willing to assume a larger burden in supplying the energy demands of the United States.

The large known reserves of coal make it desirable to use coal wherever this is economically feasible. The Geological Survey and the Bureau of Mines estimated the mineable reserves of coal at about 1,000 billion tons. At 1955 rates of production, this is sufficient for 2,000 years. So far as we know today the reserves of our other hydrocarbon fuels do not approach this magnitude.

A feeling of nationwide confidence is justified in an industry which has its feet on such a broad base of raw materials. In the face of this highly favorable reserve picture the industry grows increasingly conservation conscious in every decade. There are many reasons for this and two of the foremost are our rapidly growing population and the increased energy output per capita. Figure 1 shows that the population which is now near 170 million is expected to reach about 210 million to 240 million by 1980. Figure 2 shows the sharp increase in energy output per capita. At the present time this amounts to 800 million British thermal units per capita per year and is expected to be nearly double this by 1980. As shown by figure 3, total energy output between the present time and 1980 will increase by about 2½ times. If it is assumed that coal only takes its proportionate share of this increase, the life of even the enormous reserves of the United States is greatly reduced. It is evident, however, that coal must also assume a great deal of the energy burden now supplied by oil and gas so that the life of the recoverable reserves will probably be measured in hundreds of years rather than thousands. On this basis it is apparent that the country's store of hydrocarbons in the form of coal must be mined and used with the best of conservation practice. At the same time our national economy must not be hamstrung by inadequate energy supply.

ENERGY AT LOW COST

Superimposed on this long-range picture is an immediate picture of coal losing markets to oil and gas. It is no secret that this includes the partial loss of such markets as ships, locomotives, and homes.

The coal industry has met this problem with the most effective weapon available to it, i. e., by producing and marketing energy at the lowest possible cost. Figure 4 compares the selling price of a million B. t. u.'s from bituminous coal and lignite at the mine with the price of the same amount of energy from a typical midcontinent crude oil. In 1945 heat energy from crude oil was selling for about 66 percent more than from coal. This difference has grown greater every year since the end of World War II until now this oil is selling for 175 percent more than coal on a heating value basis. Crude oil is not, of course, used for heating purposes, but the effect of raw material prices will be reflected in the products sold to the consumer.

The coal industry believes that the effect of its better competitive position in the fuel market is now being felt. From figure 5 it is evident that production has dropped from the postwar peak of 631 million tons in 1947 to a low of 392 million tons in 1954. Production in 1955 rose sharply to approximately 470 million tons and in 1956 is estimated at over 500 million tons, and may reach 545 million tons.

It is clear that the recently increasing demand is one of the rewards the coal industry is reaping for its successful effort to hold prices steady in the face of inflation and in the face of the rising costs for competitive fuels.

Coal is again becoming the fuel used for expansion in the industries consuming large amounts of energy, such as electric power production which is preponder-

[1] Representing Pittsburg & Midway Coal Mining Co. and American Mining Congress. Consulting engineer and professor of chemical engineering, University of Maryland.

antly based on coal. Metallurgical industries, including several new aluminum plants, will secure power from coal. The expanding use of coal in these industries rests squarely on the belief that it is the lowest cost energy source for their purposes at the present time, and that the advantages for using coal are likely to grow in the future.

HOW THE COAL INDUSTRY HAS RESISTED THE EFFECTS OF INFLATION ON THE PRICE OF ITS PRODUCT

The coal industry has had no special immunity from increasing costs of materials, supplies, and labor. The single means by which mine selling price has been held steady for almost 8 years in the face of rising costs in almost every other field is increased productivity. This is clearly shown in figure 6, indicating that the output in net tons of coal per man-day has nearly doubled in the 10 years between 1945 and 1955. It is hard to conceive of any single factor or group of factors which would have helped so greatly to regain and expand markets for coal.

It is not my purpose to go into the details of how this increased productivity has been attained. As you know the past 5 years has seen the introduction of continuous mining equipment in many underground mines. There have also been important developments in loading and conveying equipment. For open-pit mining extremely large and efficient earth- and coal-moving equipment has been developed which has achieved outputs per man-day very much in excess of even these high average figures. An additional important reduction in the cost of explosives has been achieved in recent years by cooperative development work between the mining companies and one of the chemical companies.

In addition to this spectacular development in mining machinery there has been a steady improvement in every detail of the mining and handling operations brought on by the cooperation of labor and management. These factors have been very important in helping to maintain a low-cost product.

It is my purpose in calling some of these developments to your attention to indicate the progressive attitude and vigor with which the coal industry has met a most difficult situation. Given freedom to go ahead in the future and treatment in the form of taxes and other legislation as favorable as accorded our competitors we can maintain and better our position. This certainly is in the national interest in view of the very large reserves on which the industry is based.

THE COAL INDUSTRY AND RESEARCH

The coal industry is in serious need of increased research. Practically every phase of the operations can be improved by well directed and executed research effort. This includes the location and determination of reserves, mining and preparation, and utilization for all purposes.

The Bureau of Mines [2] shows that about $17 million was spent on all forms of coal research in 1955. About 5 million of this came from Federal and State sources and the rest from industry. This total is very small when compared with the petroleum industry's expenditures of about 146 million and the chemical industry at 361 million.

The coal industry is sometimes criticized for not spending more on research. On the basis of total selling price for coal it would appear that more money should be available. On the other hand, the margin of profit for practically all the industry has been very narrow, and it is of course from this margin that research must be financed. In addition, research effort today can be frittered away with little or no result unless it is well organized under competent direction and with adequate equipment. Very few coal companies are large enough to conduct research on a scale which is most productive of results.

One answer to this latter problem is industrywide cooperative research. With increased coal production it is probable that contributions to such work can be increased. At the same time, however, individual companies should carry out their own programs since this insures the competitive drive created by the benefits to be derived by a single company when its research effort is outstandingly successful.

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[2] Outlook and Research Possibilities for Bituminous Coal, Bureau of Mines Information Circular 7754, May 1956.

The coal industry, like the petroleum industry and the chemical industry, is hardheaded and will only spend a limited amount on fundamental research. Neither will it spend money on visionary, long-range projects that will not be successful business enterprises within a measurable number of years. Yet, given projects in which it can sink its teeth, like the reduction of mining, handling, and preparation costs, it comes up with effective answers.

There are dangers in a competitive approach to research with too narrow a viewpoint. For engineers and scientists to make progress they must have basic facts. Mining engineers must know the geology and physical properties of coal in the ground and of the overlying strata. Preparation engineers need facts and figures on the physical and chemical properties of coal, ash, and rock, combustion engineers need data on ignition and burning characteristics and the properties of the ash, and chemical engineers, considering coal for gasification, liquefaction, or petrochemical processes, need information on the exact details of its chemical composition and the reactions it undergoes. From this viewpoint it is evident that we must continue to collect and expand the basic data on coal. It is in this field that Government research can be particularly helpful, for it is often difficult for industry to justify expenditures for work that promises returns only in the long-range future.

From the industry viewpoint the broad fields for coal research may be listed as follows:

(1) Estimation, location, and characteristics of reserves.
(2) Mining, preparation, and marketing of coal.
(3) Transportation.
(4) Utilization for combustion purposes.
(5) Production of coke and byproducts.
(6) Utilization for liquid fuels and gases.
(7) Utilization for chemicals.
(8) Coal statistics.

The first of these fields concerning the estimation and determination of the general characteristics of reserves in the broad sense has always been a governmental function and should continue as such. The coal industry, of course, uses its own geologists and mining engineers to study those factors which have a direct effect on mining and production costs.

The second item concerned with mining, preparation, and marketing of coal is, in all its phases, the special province of the industry, and these are not fields in which the Government can work effectively, or in which it should attempt to work.

The third item, the transportation of coal, involves problems for the coal industry, the coal consumer, and the transportation is a major factor in the price paid by the consumer. Also, in recent years these costs have been rising faster than the cost of mining coal. Attacks have been made on this problem by the industry to develop cheaper methods. The consumer, as represented by the utility industry, has located plants at the mine mouth and transmitted electric energy instead of coal to reduce transportation costs. This is a problem that is the concern of the industries involved as well as the Government.

The combustion of coal is a problem that is intimately concerned with the equipment used for this purpose. The industry could not hope to investigate all types of combustion equipment. It can and does furnish useful fundamental data. Concerns manufacturing combustion equipment in the larger sizes have been outstandingly successful in the development of entirely automatic combustion equipment, including the utilization of pulverized coal. Steam boiler and furnace manufacturers have demonstrated their competence and progressive attitude in this field.

The fifth item, the production of coke and byproducts, is a specialized field with the properties of the product directly related to their final use. Much of the development work in this field has been carried on by organizations manufacturing coke ovens and by the metallurgical industries. Their ability to recognize and meet their special problems is attested by the rapid expansion of many of these industries in the postwar period.

The coal industry has always taken an active part in supplying the best possible product for coking purposes. This includes the mining and preparation of coal with particularly desirable coking properties. Developments in the field of metallurgical coke have resulted in many instances from cooperation between the coal and metallurgical industries.

The sixth item, the production of liquid fuels and gases from coal, is not now of direct commercial interest in the United States. Research in this field is often

too long range and too expensive for the industry to undertake and it is, therefore, a proper field for the Government. This is particularly true because of the general desirability to shift some of the energy burden from oil and gas to coal and because of the strategic importance of liquid fuel supplies.

Certain phases of the problems involved in the production of liquid fuels are of more immediate importance to the coal industry. These include the gasification of coal and some features of the hydrogenation processes. It is desirable to develop direct cooperation between industry and the Government in these fields.

The utilization of coal for chemicals is a field of great potential importance. The most profitable part of this operation will be in producing and marketing the chemicals, rather than producing the coal. The actual amount of coal that would be used for even some of the largest volume chemicals is still not a very great annual tonnage. There is, of course, no reason why organizations in the coal industry cannot enter into the chemical field and indeed this has already been the case in some instances. Chemical companies are also undertaking coal-mining operations. This is another field in which the coal industry can render assistance in a fundamental way. It is not in a position to compete with the chemical industry in research in this field. Its best line of endeavor would be to encourage work on coal that would lead to increased utilization.

The eighth item listed, that is, coal statistics, is properly a governmental function and one that has been well handled by the Bureau of Mines.

FUNDS FOR RESEARCH

The previous discussion has outlined the research in the coal industry and has indicated how the various industries, over the years, have assumed the responsibility for development in certain fields. In the main the division of these responsibilities is exceedingly logical and all phases are making good progress.

It is obvious that there is always room for more and faster progress. In my opinion this can be done best by increased effort within the logical research pattern which has already been developed. Various fields of endeavor have been outlined in which the Government, the coal industry, and the other related industries can function effectively and with maximum return for the money expended. These fields should be respected.

The coal industry has not been able and cannot now supply all the funds necessary or desirable for research on this great energy reserve. This has long been recognized and the government, both Federal and State, have assisted in this effort in a very limited way.

In the next 25 years coal will carry a very much larger energy burden. In this period there is no evidence that atomic power will be able to contribute more than a small percentage to our energy needs because of economic, safety, and technical considerations. As a national measure, therefore, the Government would be thoroughly justified in providing greatly increased funds for coal research.

At the present time governmental funds are not available to the coal industry or related industries for financing research in industry mines or laboratories. House Resolution 400 calls attention to the effectiveness of such programs as conducted by the Atomic Energy Commission, the National Advisory Committee for Aeronautics, and the National Science Foundation. It is my belief that one of the best and most effective means for advancing coal technology would be a program of this type devoted to coal.

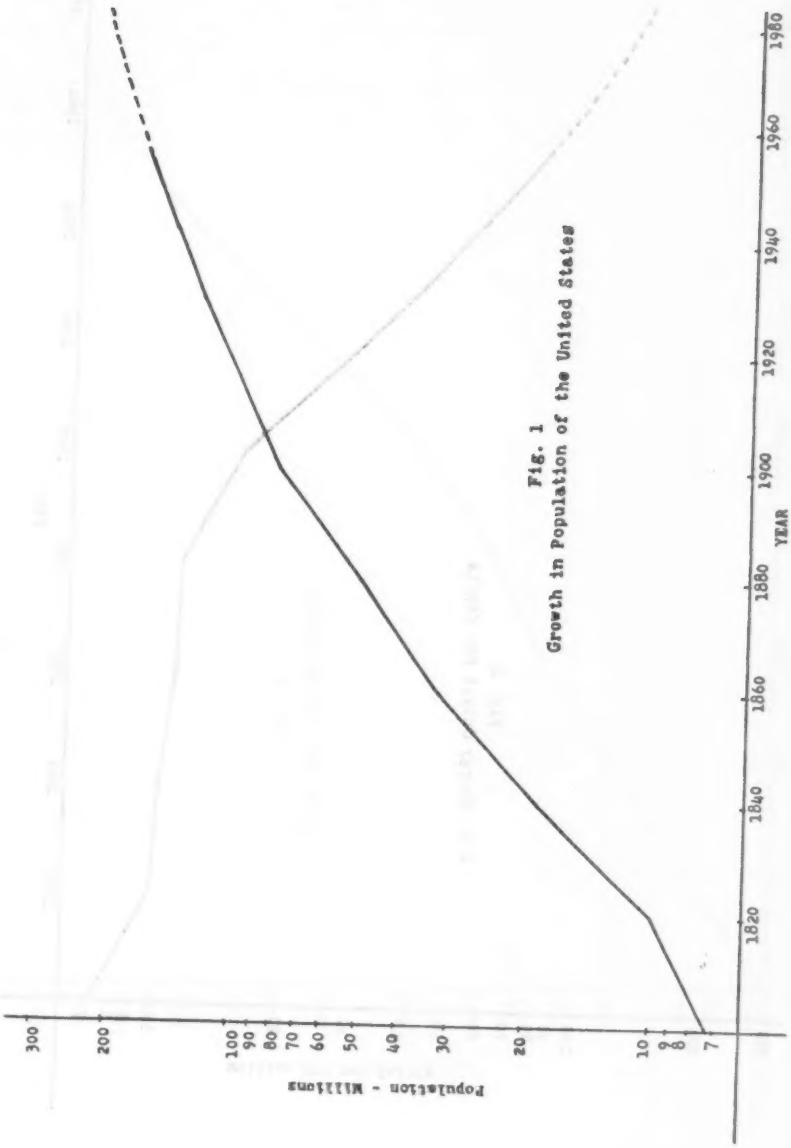

Fig. 1
Growth in Population of the United States

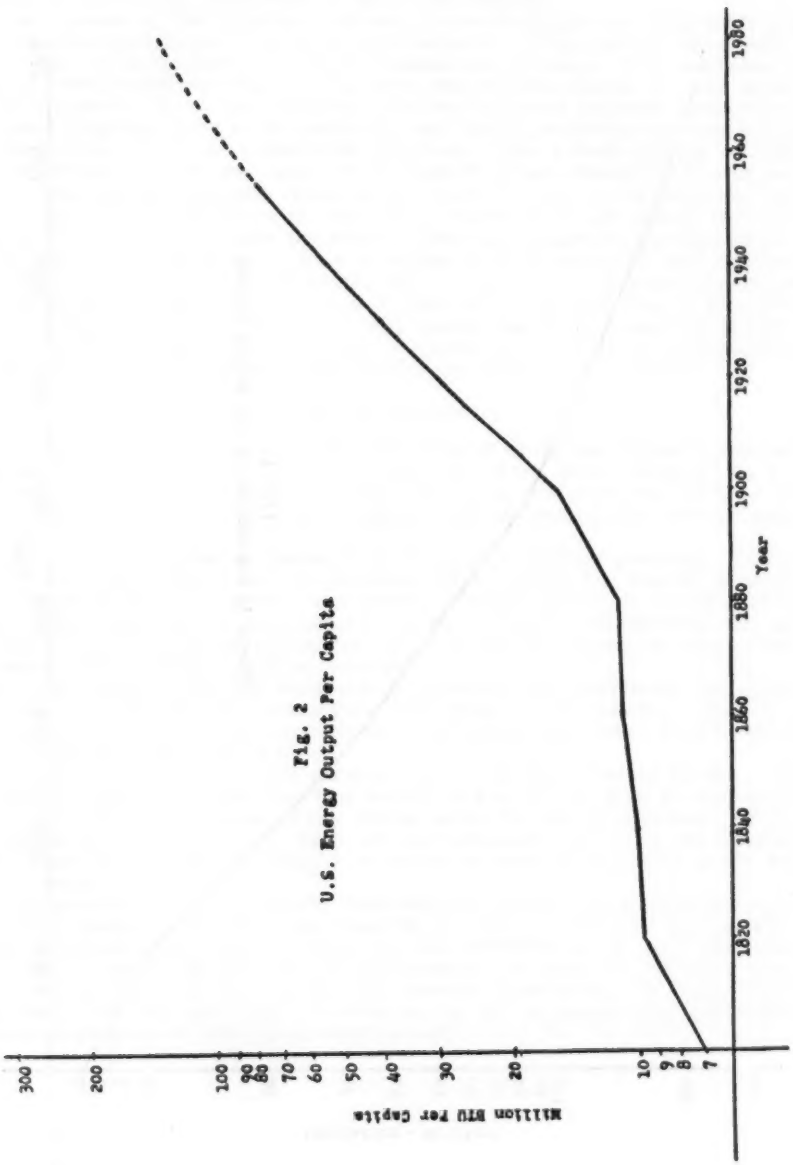

Fig. 2
U.S. Energy Output Per Capita

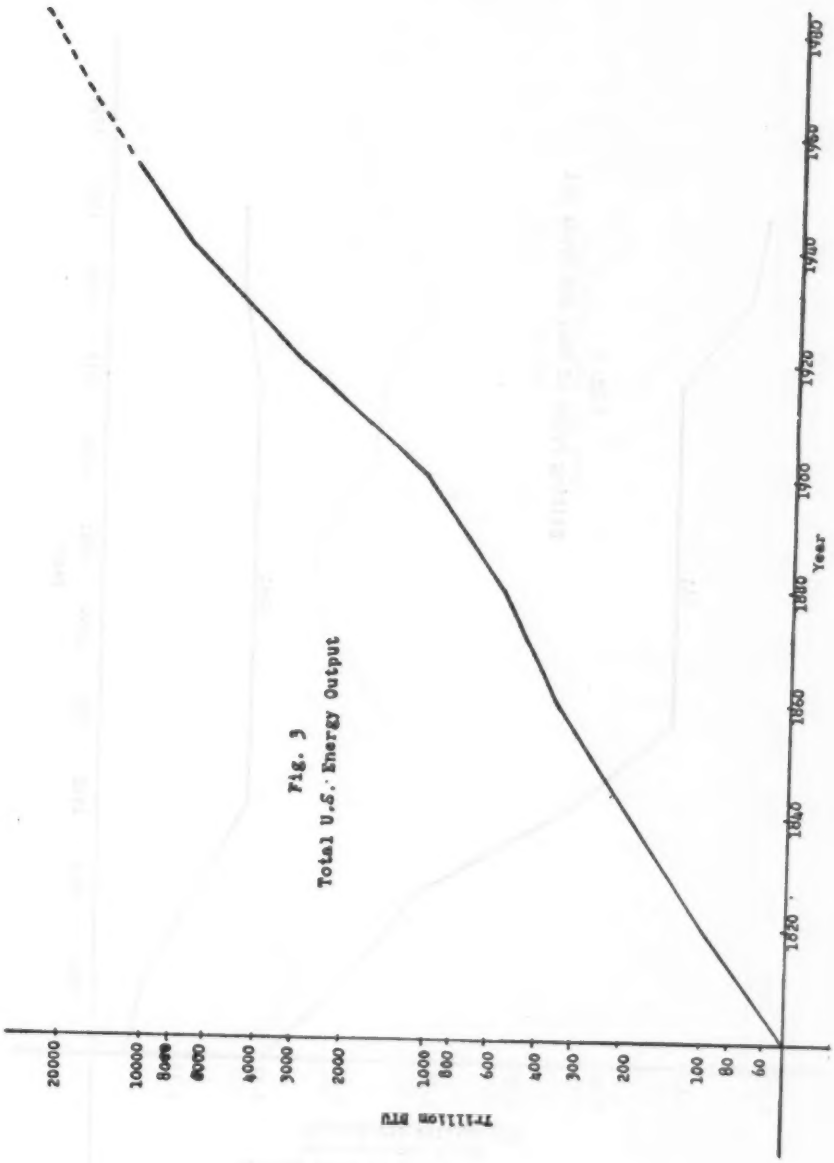

Fig. 3
Total U.S. Energy Output

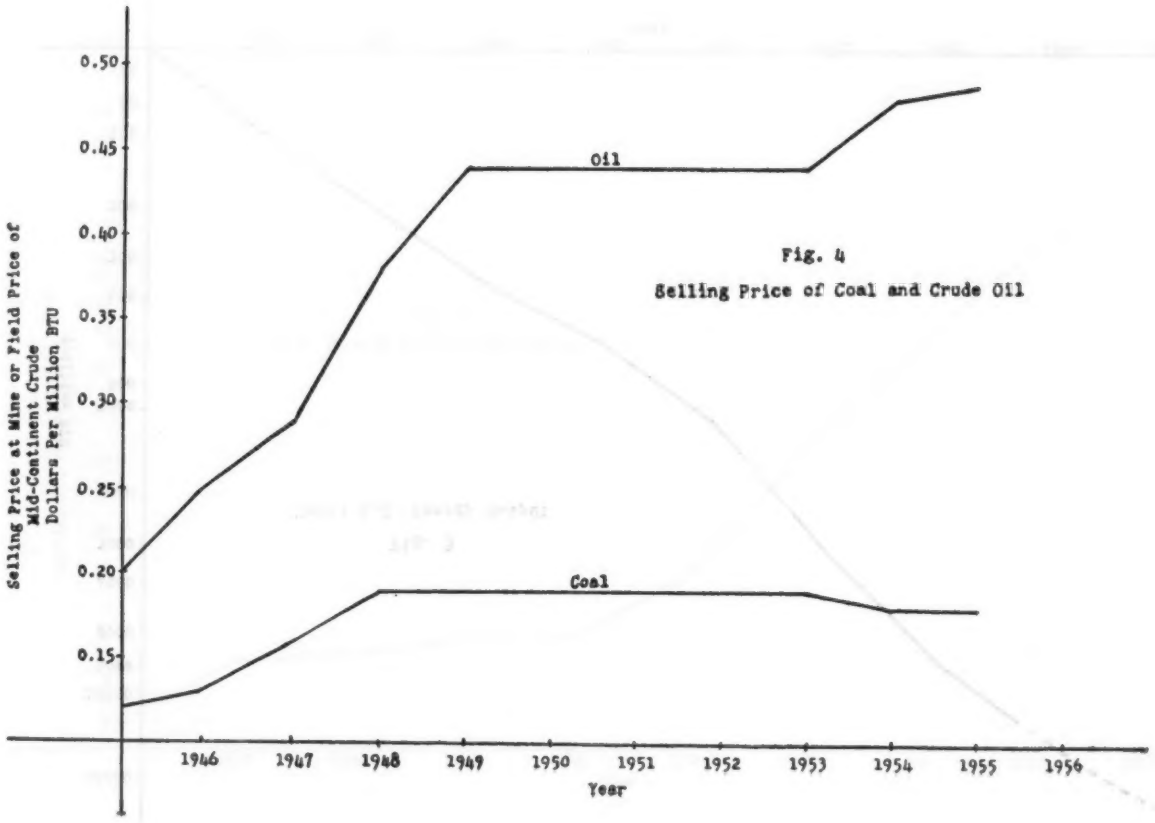

Fig. 4

Selling Price of Coal and Crude Oil

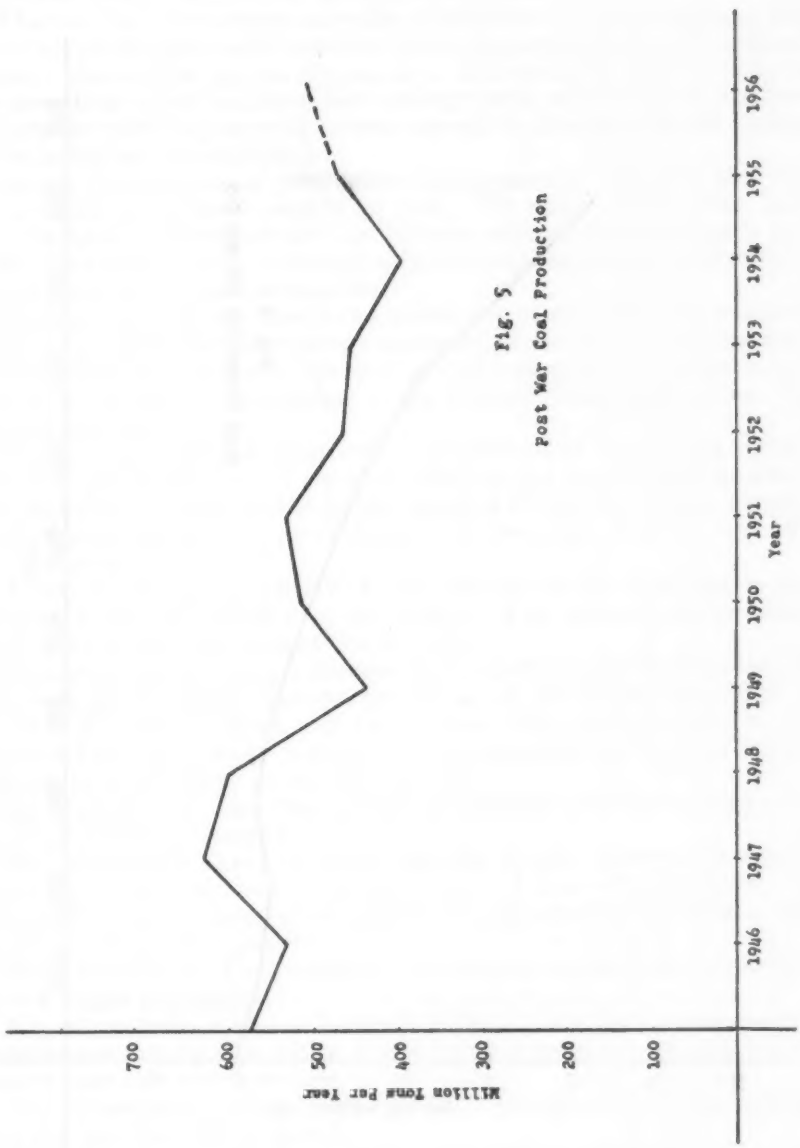

Fig. 5

Post War Coal Production

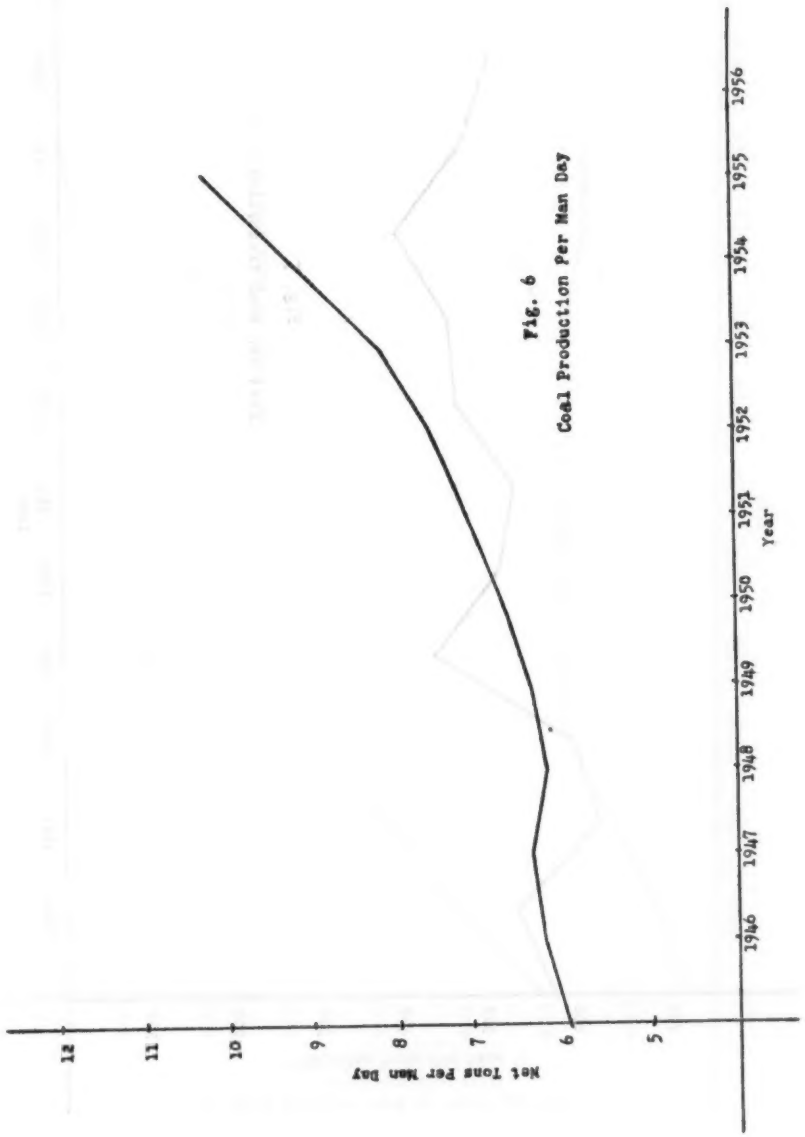

Fig. 6
Coal Production Per Man Day

Mr. SCHROEDER. I am sure that many witnesses have appeared before you who have called attention to the great reserves of coal in the United States. The country is indeed one of the fortunate countries of the whole world with respect to supplies of coal.

The coal in this country not only is available in large amount, but it is also fairly close to the surface when compared to many European mines. Some of it we can strip mine. It is unusual that we have to go more than a few hundred feet underground, whereas abroad mines of 1,000 or 2,000 feet are well known and add to the difficulty, of course, of bringing out the material.

At the present rate of production it is generally admitted that we have about 2,000 years' supply of coal. We might think from that that we have so much we could be careless with its use, but that is not true. The coal industry is exceedingly careful to mine coal as efficiently and with as little waste as possible.

Back of the need for care in the utilization of this valuable resource is the great increase in our energy demands, particularly since the war.

There are some curves in the back of this report which will give you a picture of what is happening in the United States with respect to energy demands.

The first figure shows the growth in population of the United States, and it is predicted now, if we look ahead to the period 1975 or 1980, our population is going to be in the range of 200 to 240 million people. Our present population, as of April 1 of this year, I think, was 167 million people.

As far as energy is concerned, you can see on the next figure the demand in millions of B. t. u. per capita. You will notice how steep that curve is since the turn of the century.

If you take the per capita demand and multiply it by the population, you will get the predicted energy output of the United States as a whole. I tried to extend that to the year 1980, and you will notice that total energy demand is going to be the tremendous figure of 20,000 trillion B. t. u.'s along about 1975 or 1980.

Mr. EDMONDSON. Does that projection include projected energy production in atomic energy?

Mr. SCHROEDER. Yes; it would include atomic energy. Actually these figures are on the conservative side. I took the population of 210 million for this projection, and it actually should have been closer to 230 or 240 million people.

Mr. EDMONDSON. That would lower the per capita showing, if you took a larger population?

Mr. SCHROEDER. I mean, I should multiply my per capita energy requirement not by 210, which is the figure I used, but by 240, which would raise this curve, you see.

Mr. EDMONDSON. I was looking at the energy output per capita. Did you use 210 million there?

Mr. SCHROEDER. I used 210 million population times an energy per capita of about 80 million B. t. u.'s per year.

So actually we are not talking about a coal reserve which is good for 2,000 years; we are talking about a coal reserve which is measured in terms of centuries.

For that reason, I think the industry is well aware that there is need here for careful utilization of coal supplies.

These curves do not show this particularly, but, as you realize, as time goes on, coal is undoubtedly going to be called upon to take over some of the energy that is now supplied by oil and gas. It is pretty generally realized that oil and gas are not going to continue to supply the high percentage of our total energy requirements.

There is a study that was prepared by Mr. Pogue for the Chase Bank—and I think everybody is in pretty good agreement with that, the oil industry and the gas industry—which indicates that our reserves of oil and gas are going over their peak, more or less, at the present time.

So far as oil is concerned, we can probably import oil from abroad for a period of time, but the cost of that oil will tend to be high.

As far as gas is concerned, it is not so easy to import gas. The sources from which we can get it are limited. It means we are going to have to look for other sources for gas, and I would not be surprised that coal is going to have to come in on that picture.

As far as research in the coal industry is concerned, it is a pretty small thing. As Mr. Perkins told you, the total annual expenditures are estimated at some $17 million.

If we look at the oil industry, for example, they are now spending at the rate of about $3 million a week. You can do a lot of research work for $3 million a week.

The chemical industry is spending at the rate of about $7 million a week.

That means a whole lot of people are engaged in these activities in these industries. It is sometimes interesting to go out and look at the research laboratories, for example, of the oil industry. I have had opportunity to visit the Emeryville Laboratory of the Shell Oil Co. It covers literally acres of land. There are some 1,100 people in this one laboratory. They have equipment which runs, I would say, into the millions and millions of dollars, some of it the finest equipment in the world.

If you look at the laboratories of the Esso Development Corp., for example, you have exactly the same thing—thousands of skilled technicians.

Now the coal industry can hardly support that kind of research effort. In the first place, the industry is broken up into a lot of small units. Pittsburgh Consolidation Coal Co. is perhaps one of the largest. I have had an opportunity to visit their laboratory, and I think they do the best they can with research.

But, after all, they cannot afford to support 1,100 people in 1 laboratory.

The result is that, because of this fractioning of the industry into small units, it is exceedingly difficult for the coal industry to organize and to support the type of research that the oil industry, for instance, can support.

In addition to that, I do not think it is quite fair to say that coal sells so many millions of dollars worth of products per year, and then say they ought to support in accordance with that a certain percentage of research based on gross sales.

After all, an industry, unless it makes a reasonable and sizable profit, is going to be hesitant about investing in research facilities and research skills.

So that I think you have to look to a considerable extent at the profit the industry has been able to make over a long period of time to determine how much research effort they can support.

The coal industry was pretty prosperous during the war, but there were periods before the war, and there have been periods since the war when the industry has not been in a very strong position, and has not been able to support research efforts.

One of the things that the industry has tried to do—and with some success—is to organize cooperative research. They have contributed to institute research, which has been carried out at various locations, the various units of the industry supplying so much money, depending upon their size, to support this research effort.

Even that, however, has been pretty small.

At the same time, I think you have to realize that cooperative research does have its limitations. It lacks the competitive drive that you get from an individually company-supported research effort.

By that I mean that, if you take a single company, and if they have a number of good ideas and they can carry out research on these ideas, and some of them are successful, it puts the company in an excellent position and perhaps a little more favorable position than its competitors.

Therefore, I think there is room for both types of research. The oil industry and the chemical industry do both types. But, as a whole, I think the oil industry and the chemical industry support by far the most research in their own organization.

I think it would be a fine thing if the coal companies could do the same thing. It is a point of view that this committee may want to consider.

Mr. ASPINALL. May I interrupt there? Is there any likelihood that such a program would be desired by the coal industry or could be made successful by the coal industry when the ownership of the enterprises is so widely scattered?

The only reason the oil industry is able to do it is because they have a virtual monopoly within a very few companies. Is that not true?

Mr. SCHROEDER. That is correct.

Mr. ASPINALL. But you cannot possibly have that in the coal industry, can you, Doctor?

Mr. SCHROEDER. You cannot, unless there is a wave of consolidations that invades the coal industry as it has been invading some of the other industries and is going on at the present time. I am not advocating that.

Let me go on just a minute. I will try to explain my point there a little more, if I may.

If, as a result of this resolution and subsequent action of Congress, the Government supplies support to coal research, that support could be supplied in 2 or 3 ways. The money could, for example, go to Government installations, like the Bureau of Mines. It could go to cooperative research, supported or organized by the coal industry as a whole. Or you could do the type of research, for example, that the Atomic Energy Commission carries out, in which the Commission actually grants money to an individual company to carry on a certain program.

Patents from that type of research, shop rights from those patents, go to the Government. The Government has a right to use the re-

sults of the research. But, on the other hand, the company benefits from the generation of know-how within its own organization, and so forth.

It was that latter thing that I had in mind that the committee might wish to consider if Government funds are to be devoted in the future of coal research.

Mr. ASPINALL. May I interrupt there?

Mr. SCHROEDER. Yes, sir.

Mr. ASPINALL. Mr. Chairman?

Mr. EDMONDSON. Yes.

Mr. ASPINALL. Do you say that in light of the fact you had experience with the fuels research program for years as an employee of the Federal Government?

Mr. SCHROEDER. I do say that.

Mr. ASPINALL. In other words, what you are recommending is what we know as contract research; is that not right?

Mr. SCHROEDER. That is correct.

Mr. ASPINALL. By private or by institutional employees of the Government.

Mr. SCHROEDER. And grants from the Government.

Mr. ASPINALL. And grants from the Government, yes.

Mr. SCHROEDER. That is correct.

In spite of the fact that the coal industry has not been able to support a great deal of research, I think they have done a remarkable job of picking out the point at which research was greatly needed.

As has been mentioned before, the coal industry lost markets immediately after the war. I think coal production dropped from something over 600 million tons to the low year, which was something like 350 or 375 million tons. That is a grievous blow for any industry, and it is particularly grievous if, at the same time, other activities in the United States are tending to increase.

The only way that the industry had to meet the competition which was pressing down on it—and particularly the competition, of course, from the oil industry and the gas industry—was by trying to gain price advantage.

If I may call your attention to the curve, figure 4, you will note that the selling price at the mine of coal, or the field price of midcontinent crude oil diverged greatly from about 1946 on.

You will see that the price of oil has risen steadily and in some instances very sharply during that period, while the price of coal rose slowly from 1947 to 1948. It has held almost steady, or fallen slightly, since 1948. That is really a remarkable performance in the face of the inflation that has been going on in the country during that period of time.

I think that is the one thing that has allowed the coal industry, not necessarily to regain, but certainly to expand certain of its markets, like the electric utility market, for example, which has been one of its prime customers.

How has the coal industry managed to maintain a more or less constant price in the face of rising costs?

Of course, the answer to that has been increased productivity, which has been brought about by better mining methods; by more efficient work on the part of the worker himself; and particularly, of course,

by the development of mechanization, that is, the continuous miners, and the coal mole; and by various conveying devices out of the mine.

Without going into the details of how that has been accomplished, I think it is fair to say that coal productivity per man underground has risen from around 5½ to 6 tons per man-day to in the neighborhood of 10 tons per man-day. And the end of that is not in sight.

I mean increased productivity is certainly in the wind for the future.

So it is probable that coal costs relative to other fuel costs will either remain steady or decrease. So coal will continue to gain an advantage with respect to the other fuels.

Mr. EDMONDSON. Dr. Schroeder, just to nail that down a little more specifically: Your productivity per man-day, is that in terms of 7 hours and 45 minute days, both on the 5.6-ton figure and on the 11-ton figure? Or are you taking the average day that was worked?

Mr. SCHROEDER. We are taking the average day that was worked. So actually the productivity increase is really greater than these figures show, because the day was a little longer in the thirties and early forties.

Mr. EDMONDSON. Thank you.

Mr. SCHROEDER. I think the coal industry sensed that the one big field in which they could make progress as far as research was concerned was this increase in productivity; and they have done a remarkably good job of developing and increasing their output and at least holding their advantage with respect to costs per million B. t. u.

Now, in the coal industry, of course, there are many fields in which research can be carried out. It is a big industry, and there are many facets to this industry.

As the years have gone by there has been a tendency for this research to get located in certain phases of our industrial organization, we might say.

For example, the extent and location of reserves has been to a considerable degree developed by the Geological Survey. They have given us the broad picture of how much coal is available in the United States. This is a very logical way to go about it.

The coal industry has its own geologists, its own mining people, and when they come to the development of a specific property or the laying out of a mine, that is their job, and they have always gone about it in that manner.

The industry as a whole looks at the mining, preparation, and marketing of coal as particularly their jurisdiction, and they have done the most work in those fields.

Transportation is a kind of three-headed thing. It falls partly on the shoulders of the mining industry, the coal mining industry, it is partly a question for the railroads and steamship lines, and it is to a considerable extent a question for the Government, because they enter into transportation in many respects.

When we turn to the utilization of coal, the work on burning of coals, the rates of burning, and the development of combustion equipment, particularly utility equipment and things of that type, it has largely been in the hands of the combustion people—the boiler people, for example.

In many ways it would be exceedingly difficult for the coal industry to try to enter into these fields, because, as a whole, they are not deeply

concerned or deeply aware of the problems that are involved in utility operation.

The production of coke and byproducts has been particularly the province of the steel and metallurgical industry, and they have maintained research groups to develop these processes and methods.

The utilization of coal for liquid fuels and for the production of gas and oil is not really a commercial venture in the United States today.

There is still too much cheap natural gas and still relatively cheap liquid fuel supplies. The only investigation that has been carried on of any considerable size is the work done by the United States Government.

As a whole, as far as this country is concerned, for perhaps the next 5 to 10 years, if work goes on in liquid fuels, much of it will have to be supported by the Government.

The utilization of coals for chemicals is not very great at the present time, excluding the production of chemicals from coke ovens.

There is some interest in developing gasification methods, which will allow the use of coal for the production of ammonia, methyl alcohol, and ethyl alcohol. There is one synthetic fuel plant that is producing gasoline from natural gas down at Brownsville, Tex. There is some interest in industry in this field, but it is growing rather slowly.

In the field of coal statistics, the Government of course has done most of that work, and in my opinion has done a very fine job. I think coal statistics should logically be a Government function.

The work of this committee in studying and analyzing the research problems in the coal industry is most welcome. I sincerely hope that it is entirely successful and that it can result in the development of further research effort in the industry.

I think some considerable thought has to be given to how any funds that may be available in the future from the Government are allocated to research, and I would recommend careful consideration of the type of research that is now carried out by the Atomic Energy Commission, the utilization of funds in that manner.

I think that is all I have, Mr. Chairman.

Mr. EDMONDSON. It is a very fine statement, Doctor. We are very pleased to receive it.

Would you care to identify the people who are here with you from the American Mining Congress?

Mr. SCHROEDER. Harry Moffett is here from the American Mining Congress, and Julian Conover is here from the American Mining Congress.

Mr. EDMONDSON. We are very pleased to have both of you gentlemen with us. We will be very glad to hear from you if you care to make a statement.

Mr. CONOVER. I think Dr. Schroeder has done a very fine job on stating our views.

Mr. EDMONDSON. Does the gentleman from Colorado have any questions?

Mr. ASPINALL. I do not have very many questions. The statement is most inclusive.

Dr. Schroeder, to what do you attribute the loss of interest in the synthetic fuel program which was being carried on by the Government up until just recently?

Mr. SCHROEDER. I am not sure that I would agree with you that there was a loss of interest. Certainly on my part there is no loss of interest in the program.

Mr. ASPINALL. You know, Doctor, how some of us have labored during the last 3 years for the continuation of the program, and how impossible it was to get any administrative support of any effectiveness in favor of the program. What is responsible for that?

Mr. SCHROEDER. I think, so far as I saw the picture, we had the strong support of the Department all through the period that Secretary Ickes, Secretary Krug, and Secretary Chapman ran the Department of the Interior.

Mr. ASPINALL. Did they find the answers during that time?

Mr. SCHROEDER. You mean the answers to our problems as far as synthetic fuels are concerned?

Mr. ASPINALL. Yes. In other words, did you finish the program?

Mr. SCHROEDER. In a sense, the answer is "Yes." In a technical sense. We can certainly produce liquid fuels of any type or grade from coal and oil shale. The work that was done by the Bureau of Mines demonstrated pretty conclusively that technically we could solve our problems and we could go ahead with the development of an industry.

Then the question arises immediately—What is the economic situation with respect to these technical processes?

As you realize, the economic situation with respect to cost per gallon of a product is a fluid situation. If you develop a process in 1930 that will produce a certain liquid product at a certain price, and you continue research effort on that, and you continue production effort, the chances are that the real requirements to produce that material will go down as your work goes forward, so that you can produce the material at lower and lower real cost.

The same thing is true in synthetic fuels. It was our feeling in the Bureau of Mines that we could eventually produce gasoline from coal for in the neighborhood of 15 or 16 cents a gallon at the plant.

I feel quite certain that, if that research had been pushed forward for a period of years, we could have successfully lowered production costs and come more nearly into a competitive position with the petroleum industry.

There is almost no limit to what you can do in economic research of that type. The oil industry itself has demonstrated it.

If you will go back to 1925, I think you will find it cost somewheres around 18 or 20 cents a gallon to produce gasoline. Today that same gasoline is being produced for around 12 or 13 cents a gallon, in spite of the fact that we have had very great inflation during that period.

The reason for that is that there has been a steady advance in the methods by which we take oil from the ground and the methods by which we refine oil.

To my mind there is little doubt that the same progress could be made in the synthetic fuel industry.

Mr. ASPINALL. This is what we are up against, as I see it, in Congress about extending a research program such as has been suggested for demonstration plant operation for either coal or oil shale: They say, "You had a 10-year program, and all that you came out of that 10-year program with was generalities."

I think perhaps that was correct.

In case our sealanes were cut immediately, or within the next 3 or 4 months, we are not in very much better shape to go into the production of petroleum products from oil shale and coal than we were in 1946. Is that not correct?

Mr. SCHROEDER. I do not think so.

Mr. ASPINALL. Do you have any well-established specifications for the construction of a plant to make petroleum products from coal or oil shale?

Mr. SCHROEDER. Yes, I would say that I certainly would feel I could design an oil shale plant today that would produce a full range of petroleum products from oil shale.

Mr. ASPINALL. How long would it take you to lay out that plan and to get the dies and the specifications in order, so that you could operate on an assembly line basis?

Mr. SCHROEDER. Normally I would say that you would have about a year's design work. I am assuming now a full-sized commercial plant. You would have about a year's design work and probably about 2 years of construction, if you wanted to build, say, 50,000 barrels a day.

Mr. ASPINALL. With the proper kind of a demonstration plant program, you should be able to cut that time a great deal, should you not?

Mr. SCHROEDER. Yes, with the proper demonstration plant program you should be able to cut that quite a good deal. The regrettable thing about Rifle from my point of view——

Mr. ASPINALL. I am not only thinking of Rifle, I am thinking of Louisiana, Mo.

Mr. SCHROEDER. The same thing will apply to Louisiana to some extent. But at Rifle we had just finished a new retort. We had just completed erection of it, and that retort should have had 2 or 3 years of thorough testing to get all the engineering details that you need for the design of a plant.

Unfortunately, that project was closed down before that testing program was completed. So if you ask me today what information we need and what we would like to do if we were going to build an oil shale industry, I would say we would like to collect the information that we should have collected on the Rifle plant in the first place.

Mr. ASPINALL. And that is what the Members of Congress said. Why did you not collect it as you went along? And why do you not have it ready for use now so that you can give us something concrete that came out of those research operations?

Mr. SCHROEDER. I would answer that in two ways. I would say we could not collect data on the plant until it was built and completed, and we did not get it built and completed until the project was pretty well shut down.

Now, it is true—and I made my statement at the beginning on the basis of that smaller pilot-plant work—that we collected a great deal of data on smaller pilot plants that operated at Rifle, and if we were forced to design an oil-shale plant today, we would design it on the basis of that smaller pilot-plant data.

Mr. ASPINALL. But some bugs may still be there?

Mr. SCHROEDER. The chances of the bugs being there are much greater than if we had been able to complete our work. That is correct.

Mr. ASPINALL. I think that is all.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. Doctor, you have made an excellent statement here, but I cannot agree with all you have said, and I will have to take you to task for a few of those things.

Not that I think you attempted to mislead us, because I think you have intended to be helpful. But you have left, I think, the impression in the minds that it is possible by research to continue to get this thing down to nothing.

Now, there is a certain bottom or floor beyond which even research cannot get costs down.

Mr. SCHROEDER. That is right.

Mr. SAYLOR. So that the statement you made here that the oil companies have reduced the cost of gasoline in 25 years one-third does not indicate that in the next 50 years they are going to get down so they can produce gasoline from oil for nothing.

Mr. SCHROEDER. No; that is correct.

Mr. EDMONDSON. Will the gentleman yield?

Mr. SAYLOR. Yes.

Mr. EDMONDSON. At the same time, while bringing the costs per gallon on down, they have also produced a much more productive gasoline, have they not?

Mr. SCHROEDER. A much better gasoline.

Mr. EDMONDSON. The same thing the coal industry has been doing—not only increasing productivity, but I understand the selectivity of the production is much better, so that you are getting a better ton of coal out of the mine; is that correct, or not?

Mr. SCHROEDER. Yes. The preparation of the coal and the quality of the coal has been greatly improved, and the same thing is true of gasoline.

Particularly I think you are thinking about octane ratings and diesel fuel cetene ratings.

Mr. EDMONDSON. Yes.

Mr. SCHROEDER. May I say a word on that, Mr. Saylor?

Mr. SAYLOR. I want you to. I did not want to leave the impression I am disagreeing with you, but I want to straighten up what I think is a situation that might lead some people who read this testimony to believe it was your opinion, if you had enough research you could get it down to zero.

Mr. SCHROEDER. No; I do not believe that. I certainly did not mean to imply that you could get the cost down to zero. But I would like to compare the amount of effort that has gone into the coal work with the amount of effort that has gone into research on petroleum.

The coal-hydrogenation industry was developed in Germany over a period of years, and when we went over there at the end of the war, I think there were about a dozen coal-hydrogenation plants. The process was brought to this country and a great deal of research work done on it. We built demonstration plants and continued laboratory research. I suppose in the Bureau of Mines' program the total expenditure of funds for the research and for the demonstration plants was in the neighborhood of perhaps $60 million. I do not say that as an exact figure, but it was in that neighborhood.

We then have behind the coal-hydrogenation process a dozen plants and $60 million worth of research effort in this country.

Now look at the petroleum industry, for example. I suppose you might say the petroleum industry started in 1859 in your State, Mr. Saylor, at Titusville. Not much was done in the way of what we look at as research for a number of years.

But if we bring this process up to date, how many petroleum refineries are in the United States? I do not know, but literally hundreds and thousands of them; are there not?

Mr. SAYLOR. Yes.

Mr. SCHROEDER. How much research effort has gone into the petroleum industry over this long period of time I do not know, but if we are talking about spending $150 million annually, certainly the total expenditures in millions of dollars in petroleum research has been enormous; has it not?

Mr. SAYLOR. Yes; but, Doctor, has not the research been only in recent years?

Mr. SCHROEDER. I would say when I went to college, which was 1926–30, the petroleum industry was getting into research in a considerable size at that time, and the effort has expanded greatly ever since then, and continuously.

So that you can see that we might have said that in 1925 or 1930 the petroleum industry was pretty near the end of its research effort. Perhaps we might have said they could not do much more. But it was not true at all. I mean the efforts of thousands of intelligent people have driven their costs down steadily.

Certainly there is no reason to believe that the same effort applied to coal hydrogenation or the other processes for converting coal to oil would not also be successful in the economic sense. And if we would do work on the scale of millions of dollars a year on those processes, I think we would get a much better economic picture as far as the cost of liquid products from coal is concerned.

Mr. SAYLOR. Would you recommend that the committee look into reviving not just the plants in Colorado and Missouri, but look into actually reviving research on the entire uses of coal?

Mr. SCHROEDER. I would so recommend. I would like to point out, however, that the synthetic-fuel program, as far as the Government is concerned, is not dead. There are still four or five million dollars a year that is going into research at Bruceton, Pa., and Morgantown, and I think some in Laramie, Wyo., on oil shale.

So it is not dead.

But I would say this: That there is, it seems to me, very strong reason to increase the activity in liquid fuel research in the United States.

I would like to call your attention to a publication here which has recently been issued by the Chase Manhattan Bank. It is a study by Joseph E. Poque, who is a recognized petroleum consultant, on the future growth and financial requirements of the world's petroleum industry.

He shows several things. He shows that the demand for petroleum in the United States has exceeded the highest estimates made a few years ago.

I had the privilege when I was in the Government of trying to estimate petroleum requirements for the period, say, 1950 to 1975. We did the same thing in estimating those requirements that has been done here for coal. We took the requirements for petroleum per capita

in the United States, and multiplied those requirements by the estimated future population of the United States, and we came up with figures for petroleum demand which were much higher than anybody else had ever figured.

The industry was quite critical of those figures when we published them. Those were published about 1949.

Now the actual demand for petroleum has exceeded the highest estimate we made, Mr. Saylor.

Mr. SAYLOR. That is in a matter of 6 years?

Mr. SCHROEDER. In a matter of 7 years now. Mr. Pogue has replotted a lot of these estimates, and he shows that many of them were far wrong. I feel pleased at least that we came close to the actual figures.

As I mentioned a few minutes ago, the indications are that we are getting very close to the peak production for petroleum at the present time, and we may be going down the other side of the curve.

Mr. SAYLOR. That is only as far as this country is concerned?

Mr. SCHROEDER. That is as far as the United States is concerned.

For the future there is going to be an increasing spread in the amount of oil that we must get from some other sources.

I do not know whether the United States is entirely safe as far as security is concerned to depend on oil from abroad.

I mean, the world as a whole is depending very greatly on Middle East oil. Maybe that is safe, and maybe it is not. But there is every reason to believe that the cost of finding oil—and certainly if we have to compete on the world market for oil—most of the European countries are in the habit of paying considerably higher prices for oil than we are. If we have to compete in the world market for oil, there is good reason to believe that the cost of oil to the country is going to rise.

If that is the case, it makes the situation with respect to synthetic fuels more favorable.

As far as security is concerned, there is strong reason to believe we ought to have as much production of oil in the United States as we can have.

Mr. Pogue goes on to show the capital requirements for the petroleum industry in 4-year periods up to 1965. He shows that for the period 1956–65 the capital requirements in the United States to keep oil flowing in the amounts we need will be $73 billion. Even in the day of relatively low-cost money, that is still a pretty good-sized figure.

Mr. SAYLOR. That is new capital that is going to be necessary?

Mr. SCHROEDER. New capital that is going to be necessary up to 1965. It covers the period from 1956 on to 1965.

So my feeling is there is strong justification for this country going into and continuing a research program on synthetic fuels, and I would say that program ought to be increased from its present levels.

Mr. ASPINALL. Will the gentleman yield?

Mr. SAYLOR. Yes.

Mr. ASPINALL. You do not mean the kind of program we have at the present time, a test-tube program, but you mean the pilot plant and the demonstration plant?

Mr. SCHROEDER. Right.

Mr. SAYLOR. In other words, once we have developed it to the stage that they have gotten as many bugs out of it as they can in the small plant, you feel we should go ahead?

Mr. SCHROEDER. I think we should go ahead; yes.

Mr. SAYLOR. If there were several processes developed, how far do you think we should go? Do you think there should be a pilot plant in each one, or a demonstration plant in each one?

Mr. SCHROEDER. There should be a pilot plant on each one, unless you can show that one is economically much more advantageous than the other, and then you would quit on the other process.

Mr. SAYLOR. I am very much interested in your statement, especially with your background, as to what would happen if it became necessary for this country to build a plant. I do not know of anybody else I would feel is better qualified than yourself to tell us the approximate length of time it would take to get a synthetic fuels plant into production. I think it is a matter that should be of great concern to the Department of Defense to realize that, if these potential sources are shut off as far as Europe and even South America, it would quite likely take us 3 years to actually get a plant designed, built and in operation. Because in this day and age I do not think we could survive 3 years of war to get a plant going.

Mr. SCHROEDER. No; I do not, either. Under great pressure it might be cut somewhat.

Mr. SAYLOR. I know, but you have still got to design it, and there is not much you can cut down. If there is any place that could be cut at all, it would not be a material reduction.

In other words, you could not cut it 50 percent.

Mr. SCHROEDER. No, sir; I do not believe you could.

Mr. SAYLOR. If you got all the best engineers working on one project, you could not do it?

Mr. SCHROEDER. It would be very difficult to cut it 50 percent.

Of course, returning to Mr. Aspinall's viewpoint, the logical time to work out these difficulties and to get ourselves organized is not after the difficulty has started, but right now.

Mr. SAYLOR. Were you in the room when Mr. Perkins testified? I never thought of this until he made his statement, which brought to my mind this question which I asked him: Whether or not you think there would be anything for this committee to look into as far as encouraging coal companies to institute or step up their research program if the depletion allowance was increased from the present 10 percent to be comparable with the oil and gas depletion allowance of 27½ percent?

Mr. SCHROEDER. That depletion allowance, of course, is a powerful instrument.

Mr. SAYLOR. In other words, my thought, very frankly, as I heard Mr. Perkins talk about it, was this: Maybe we could not come out and sell the bill of goods to the public that you would increase the depletion allowance of the coal companies per se from 10 to 27½ percent, but if they were willing to expend funds somewhere between that 10 and 27½ percent, that they would be allowed to charge it off as a capital expenditure for income tax purposes, rather than a depletion allowance.

Mr. SCHROEDER. You mean charge it as an expense?

Mr. SAYLOR. Yes.

Mr. SCHROEDER. I think that would be exceedingly helpful.

There is only one thing about this depletion allowance comparison between the coal industry and the oil industry.

As I understand, the petroleum industry cannot take a depletion allowance which is more than 50 percent of their net profit. I am not at all sure if you increase that 10 percent for the coal industry that the coal industry would benefit too much if you took into account their net profits.

Mr. CONOVER. There is the limitation. Mr. Saylor, under depletion to 50 percent of net income. In other words, to take full advantage of the 27½ percent depletion allowance, you would have to have 55 percent of your gross as profit. In other words, as high a figure as that is not realistic at this time.

On the other hand, increasing the 10 percent to a higher figure, whether it be 15, 20, or whatever it might be, would benefit a substantial number of coal companies.

Mr. SAYLOR. Thank you, Mr. Conover.

I was interested—you have probably seen it, Dr. Schroeder—in the report which came out in Business Week for the 9th of June, entitled "How Coal Rebuilds Itself To Clinch Brighter Future."

It is a summary made by one of the men who, I understand, was out at the American Mining Congress in Cincinnati.

This man shows, among other things, how the top 15 companies have changed in the past 4 years, that Pittsburgh Consolidated Coal and United States Steel still remains Nos. 1 and 2, but there has been a tremendous change in some of the others.

Mr. SCHROEDER. I did not see that article, I am sorry to say.

Mr. SAYLOR. It is very good, I think, and worthwhile for everybody to read.

There is a movement, of course, toward consolidating, and especially getting rid of high-cost mines. I know that some of the companies in western Pennsylvania, for example, have closed down mines, not with the intent of allowing them to lose the coal as they are keeping them pumped out. But they just happen at the present time to be high-cost mines, and with the present means of mining it is not possible to mine them in competition.

Therefore, they are mining at the present time their mines with drainage and other facilities, a little better roof, which makes mining a more profitable proposition and more able to compete.

I am wondering what fields in general which have been specified by the chairman in his 14 points, which he wanted the committee to go into, do you feel the companies would lend their best support to?

Mr. SCHROEDER. Let me look at this list I have here.

The mining and marketing of coal: Obviously that is the field in which the coal-mining industry is best qualified, or well qualified to work, and it is in a field in which there is great opportunity for research effort.

I think there is some opportunity for research effort in transportation. There has been a good deal of talk about pipeline transportation of coal over short distances, it is true, but I still think that ought to be very carefully studied.

There is a great field in the question of combustion of coal. A large amount of research remains to be done in that field.

In spite of the fact that we burn coal successfully, we learn a little more about it every day.

If we sit down now to design a boiler even for a utility company, you will find great difficulty in determining exactly how fast the coal will burn, how quickly it will ignite, what will be the effect of small additions of excess air—just fundamental data of that type that is not available.

I try to do those things every once in a while myself, so I can say quite definitely that much of the data is not there.

Research in that field would be exceedingly helpful. Whether that research is going to be carried out by a coal company or by a combustion company I do not think needs to be determined at this time, but it is work that should be done.

The production of coke and byproducts: There is a great deal of research to be done on coke production. As you may know, coke ovens are getting very costly to build, and you have probably seen how the steel industry has raised the question of new capital costs.

The coke oven is one of the important items in that.

Research there would be very helpful. If research could do anything toward cutting the capital cost of coke ovens, it would be very useful.

Research which would allow us to use some of our slightly lower grade bituminous coal in coke ovens would be helpful. Maybe we can go to a little higher sulfur for metallurgical purposes.

Things of that nature would open up vast properties not now useful in cokemaking.

Mr. SAYLOR. In other words, that would involve cooperation with steel companies to determine methods for reduction of sulfur when the coke was used?

Mr. SCHROEDER. Right. The same thing is true of taking some of the coals which are on the borderline of coking coals and turning them into coking coals.

We know technical processes for doing that, but the economics must be worked out.

We have talked a good deal about liquid fuels and gases. I think I have given you my views on that.

The utilization of coal for chemicals is a field that needs pretty thorough exploring.

As you may know, the Bureau of Mines, the Texas Power & Light Co., and the Aluminum Company of America have in operation a small pilot plant down at Rockdale, Tex., in which they are taking the tar out of the coal, with the hope that they can convert that tar to chemicals. The Batelle Memorial Institute is doing a great deal of research in that field. The Southern Research Institute and the Alabama Power Co. have a similar project underway. The United Gas Engineers in Philadelphia also have such a project. That work, in my mind, could be increased with great benefit to the coal industry and to the country as a whole.

I feel strongly that coal statistics should be expanded, and it would be particularly helpful if we could get the statistics a little more promptly than we do. I do not know what needs to be done to do this, but it would be helpful if those statistics were available a little quicker.

Mr. SAYLOR. Doctor, since you have gone down to work at one of these coal companies, you are probably finding more and more what some of us have known for a long time: When you find a man who is in the coal business, he is quite an individualist, he is a rough-and-ready fellow. If you find something, he wants to put it to use in his own company, and if he can gain a little advantage for his own company, he uses it.

Mr. SCHROEDER. Yes.

Mr. SAYLOR. That is the same thing that you have referred to in your research on a little larger scale, I think, as far as the oil companies are concerned—that even though there is tremendous research being done, and there may be some duplication, they do it to gain an advantage for their own company.

Mr. SCHROEDER. Yes.

Mr. SAYLOR. Yet I think they have a clearinghouse, or a place wherein certain information which is beneficial to the entire industry is made available, even though they keep for advertising purposes, or whatever it is, some of the features for themselves.

Mr. SCHROEDER. Yes.

Mr. SAYLOR. What segment, if any, could you point out, that the Bureau of Mines might be used as a clearinghouse for certain features, as distinguished from those things which the companies might then develop and want to help themselves?

Mr. SCHROEDER. In answer to that question, I would say that the estimation, location, and characteristics of reserves is a field in which the Bureau of Mines has always been active and should continue.

Mining, preparation, and marketing of coal is largely an industry interest. The spirit of competition should enter into that research.

Mr. SAYLOR. Do you think that should extend into the cleaning plants and the type of cleaning plant that is being used?

Mr. SCHROEDER. I do.

Transportation, I believe, is sort of a triple-headed thing, with the Government and the coal companies having a definite interest, and the transportation companies, of course, having an interest. I think all three will have to cooperate in that work.

Utilization for combustion purposes. I am inclined to believe that that study would progress fastest if it were kept in the hands of the companies.

Production of coke and byproducts is, again, strictly a company operation and not necessarily only the coal companies, but the metallurgical industry as well.

Mr. SAYLOR. This committee has been notified that there is a gentleman who says he has a patented process for coking of anthracite. Just in my own mind I have been trying to figure out if that is something the Bureau should get into, or whether or not one of the companies in the anthracite field should become involved. I am perfectly frank to tell you I have come to no definite conclusion.

Mr. SCHROEDER. When you talk about the coking of anthracite, is he talking about the utilization of anthracite in a coking process, or is he truly talking about the coking of anthracite?

Mr. SAYLOR. He is talking about producing metallurgical coke from anthracite.

Mr. SCHROEDER. Anthracite alone?

Mr. SAYLOR. Anthracite alone. Heretofore it has been said it could not be done. This gentleman comes forward and says he has a process whereby it can be done.

Mr. SCHROEDER. You know, at one time the steel industry used a lot of anthracite in place of coke. I think this goes back to about 1900, but there was a great deal of it used.

Mr. SAYLOR. That is correct.

Mr. SCHROEDER. Then, if I remember correctly, the University of Pennsylvania, along about 1936 or 1938, investigated anthracite from the various regions in Pennsylvania, and its use in blast furnaces, and they came to the conclusion that if you got an anthracite that did not decrepitate, break apart when heat hit it, that you could use it in a blast furnace.

There have been times when the blast furnaces have used certain percentages of anthracite mixed with coke.

Mr. SAYLOR. In the period even at the end of World War II and the Korean incident, during the extreme shortage of coke, I know many of the steel companies mixed anthracite with their coke.

Mr. SCHROEDER. I guess that is correct. I do not know what his patent covers, but when you say the coking of anthracite, I am disturbed because I cannot conceive how anthracite could be coked. It does not go through a plastic state in which coke can be formed—but I can easily understand how you can use anthracite in a blast furnace. To go on, at the present time I think this liquid fuel and gas work is going to have to be supported by Government funds. I think certainly a lot of that research will have to be done in the Government.

On the other hand, there may be phases of that research which could be very well handled by some of the industry people.

You know, one of the things that always was troublesome when we were dealing with the funds in the Bureau of Mines was that, even if somebody came to us with a proposition that he could handle very well in his own organization—he might have had the equipment and manpower to do a job—there was never any very easy way in which we could allocate Bureau of Mines funds to that work.

I always felt that that was a gap in our approach to this coal research program, because we either had to take the work completely away from the man and make it public property, or we had no way of supporting it at all. Your committee might want to give that difficulty some thought.

Mr. SAYLOR. Knowing that, this committee has really revised its thinking, because in the process of producing potable water from salt water, the committee has recommended and the Bureau has gone along with us in utilizing independent research facilities.

Mr. SCHROEDER. Yes, I am fairly well acquainted with that salt water program, and I think they have a very fine setup for carrying out this work.

Mr. SAYLOR. Something of that same idea is, I believe, what you have just recommended now.

Mr. SCHROEDER. That is correct.

Mr. SAYLOR. That if the Bureau would desire to let some company proceed with a part of the research, they should be allowed to do it?

Mr. SCHROEDER. That is correct.

Utilization for chemicals is something that should be of major interest to the companies.

Coal statistics is, I think, a Government function.

Mr. SAYLOR. Doctor, I certainly appreciate this opportunity to examine into your mental processes a little, and to have you help this committee. I know you have made a tremendous contribution to us.

Mr. SCHROEDER. Thank you.

Mr. SAYLOR. I know I will be in touch with you again.

Mr. EDMONDSON. The gentleman from Colorado.

Mr. CHENOWETH. Dr. Schroeder, it is a great pleasure for me to see you again.

Mr. SCHROEDER. I am glad to see you again.

Mr. CHENOWETH. I have not forgotten the many courtesies you extended when you were directing the synthetic fuel program in the Bureau of Mines. I used to be almost a daily customer of yours in making inquiries. You will recall my interest in trying to locate synthetic fuel plants in southern Colorado.

Mr. SCHROEDER. Yes.

Mr. CHENOWETH. How long were you director of the synthetic fuel program in the Bureau of Mines?

Mr. SCHROEDER. About 9 years.

Mr. CHENOWETH. Over what period?

Mr. SCHROEDER. 1944 to 1952. Eight years.

Mr. CHENOWETH. About 8 years?

Mr. SCHROEDER. Yes.

Mr. CHENOWETH. I think it was during the years 1951 and 1952 that I had my contacts with you.

At that time you recall I was a member of the House Committee on Interstate and Foreign Commerce.

Mr. SCHROEDER. That is correct.

Mr. CHENOWETH. And you appeared before our committee in connection with the synthetic fuel program. I think the Interstate and Foreign Commerce Committee was undertaking some such study then, or was interested, at least, in the same problem we are facing here today.

Mr. SCHROEDER. That is right.

Mr. CHENOWETH. Doctor, you recall that there was a contract awarded, or at least there was a discussion of a contract for a large synthetic fuel plant to be located, I believe, in Illinois. I remember over a long period of time there was constant talk and discussion and interest in this plant. I do not know whether it was ever announced.

Can you give us the history of that?

I was always curious to know what happened in that situation. The Congressman who represented that district in Illinois told me that the contract had been awarded, and they were going to start work. That was rather a large operation, as I recall. It ran to several hundred million dollars, did it not?

I wonder what happened in that picture. My mind is rather hazy as to what actually took place.

Mr. SCHROEDER. I am not sure I can recall all the details, but there was a bill——

Mr. CHENOWETH. No legislation was involved. This was something else.

Mr. SCHROEDER. There was a bill introduced.

Mr. CHENOWETH. There was no legislation involved in this situation.

Mr. SCHROEDER. I probably have a copy of it some place. I cannot remember who introduced it now, but I should have a copy of the bill in my files. There was a bill introduced to build a prototype commercial-sized synthetic liquid fuel plant. I have forgotten the total sum of money involved or suggested in the bill, but it was in the several hundred millions.

Mr. CHENOWETH. $400 million is what I seem to recall.

Mr. SCHROEDER. It was in the three- or four-hundred-million-dollar range.

The bill, I suppose, was largely the result of our belief that we were about ready to move into a synthetic fuel industry, and there was quite a lot of interest in it. The financial people who were particularly interested were the Eberstadt Co. in New York.

Mr. CHENOWETH. I remember that name.

Mr. SCHROEDER. I think they talked to a number of oil people, and I am sure they talked to people in the coal industry with respect to details of handling this operation.

At that time I believe we were still on gasoline rationing, or at least there was considerable fear we might not have enough oil. It was also about that time, I think, the picture began to change with respect to oil supplies.

More oil was available from abroad. The bill actually was never enacted, so that project just died.

Mr. CHENOWETH. I do not recall the legislation, and I do not recall that any legislation was necessary. I think either the Defense Department, or maybe the Secretary of the Interior, had the authority to do it.

I remember we were in the Korean situation at that time, and it was just as good as settled, as I recall, at one time. I think Koppers, of Pittsburgh, was to get it.

Mr. SCHROEDER. Eberstadt had talked to Koppers a good deal about contracting for the construction of this plant. That is correct.

Mr. CHENOWETH. It was to be located in Illinois.

Mr. SCHROEDER. The site was never decided upon.

Mr. CHENOWETH. I think it was pretty close to being decided upon. I know I was disappointed because we did not get it in Colorado.

Mr. SCHROEDER. Several areas were considered, and Illinois was certainly among them. Also Colorado was considered. But I do not recall any decision being made on Illinois.

Mr. CHENOWETH. It was pretty close to a decision, I think. I wondered what happened at that time.

Mr. SCHROEDER. My feeling was the reason it did not go ahead was this legislation was never passed.

Mr. CHENOWETH. As I recall, legislation was not a requirement in it because there was authority through some of the war emergency programs in effect at that time.

The reason I asked for that information is to bring us up to the present. Just where are we?

You were head of the department in the Bureau of Mines for 8 years?

Mr. SCHROEDER. That is right.

Mr. CHENOWETH. You were very close to that program. I think you did a splendid job down there. I got the definite impression in my contacts with you and with others we are not ready to go into

such a program. I think you were advocating it, but others more or less frowned upon it. We never did go into it, and are not into it yet.

Just where are we headed in this picture?

You say in your prepared statement that production of liquid fuels and gases from coal is not now of direct commercial interest in the United States. I think that is the same attitude, more or less, you took at that time—you cannot produce a synthetic fuel from coal in competition with petroleum. Is that still the situation?

Mr. SCHROEDER. I would say it is definitely the situation today. You cannot produce synthetic fuel from coal to compete with petroleum products at present prices.

That is not true with oil shale. I believe that is just about on a competitive position today.

Mr. CHENOWETH. You always took the attitude that oil shale would come first if we went to synthetic fuels.

Mr. SCHROEDER. That is true today. The Union Oil Co., as I understand, is doing quite a lot of work in your State right now toward building a sizable pilot plant for oil shale.

Mr. CHENOWETH. I think they are very much interested in that Rifle area.

Mr. SCHROEDER. I understand they are spending several million dollars out there on this operation. Union Oil, as you know, owns a great deal of that oil shale reserve. If they go ahead and show that the original estimate of the costs was substantially correct, I should think they would be in about a competitive position in the petroleum industry today.

Mr. CHENOWETH. Did you ever hear of a company by the name of Cotarco?

Mr. SCHROEDER. Yes.

Mr. CHENOWETH. What do you know about that company?

Mr. SCHROEDER. Very little I can say with assurance and definiteness.

Mr. CHENOWETH. The only reason I asked, just in the past year that company considered locating a synthetic plant in southern Colorado—in Walsenburg, Colo. It never developed.

Mr. SCHROEDER. That was the coal carbonization program.

Mr. CHENOWETH. Yes. There was some question about the process or the plant involved, I do not know what. It never materialized. I wondered if you know anything about it.

Mr. SCHROEDER. I have seen a number of their statements, with some of which I do not agree.

Mr. CHENOWETH. I know there has been some controversy over the plan.

Mr. SCHROEDER. Yes.

Mr. CHENOWETH. To sum it all up, Dr. Schroeder, to be both factual and realistic about this, we are now faced with the situation as of today that production of synthetic fuel from coal is not now a matter of commercial interest in these United States?

Mr. SCHROEDER. At this present time that is correct.

Mr. CHENOWETH. I am sure the committee does not want to be misled, or does not want to look upon something as existing which is not going to exist for a while. What is your suggestion to the committee now? What should we do?

You had 8 years to develop this. What else could you have done that you did not do?

Mr. SCHROEDER. Let me go back and answer your questions, so far as I am able.

We recommend, and I wrote an article once suggesting we build certain prototype synthetic liquid fuel plants. That was during the period after World War II along about the time of the Korean war when this country had trouble meeting its gasoline demands.

No work was ever done toward developing those prototype commercial plants.

As the years went by after the Korean war there grew a certain excess of petroleum capacity in the United States, and that excess exists today. It is probably better than a million barrels a day. In addition to that, a great deal of oil has been imported which has relieved the pressure on the domestic industry.

So that as of today we certainly have all the petroleum we need and, in my opinion, at reasonable prices.

On the basis of that viewpoint, I say there is no commercial interest in synthetic fuel today, and the conclusion follows from the situation.

I think everybody in the petroleum and the gas industries feels that because of the indications that our future demand for energy is going to increase sharply, that this situation is a temporary one, and that, if we will look 15 years into the future, we are going to need our hydrocarbon resources very badly.

So if our picture is correct—and certainly we have every right to believe that our liquid and gas resources are considerably less than our coal resources—then we ought to look to the conversion of our coal resources to those things we have in limited supply.

Now you say we have done 10 years' research on this work, and is there anything more we can do. I would ask you to look at the complexity of a coal hydrogenation operation. It takes in mining, it takes in preparation of the coal, it takes in the handling of that coal in high-pressure equipment, it takes in gasification of coal with oxygen, and other processes that have only very recently been developed. You move this coal at high temperatures in contact with high-pressure hydrogen, which is in itself a complex and not understood chemical reaction, and you take the product out, and then you go through special steps of refining.

Each one of those operations is in itself the basis of a whole industry. So while 10 years' research appears a good deal of time to work on this, it is in some aspects as complicated as atomic energy, and nobody thinks, after 10 years' research in atomic energy, with the expenditure of about $4 billion a year, that we are done. We are just getting started.

Mr. CHENOWETH. Is it true that Germany was getting all of their fuel through synthetic processes at the end of the war.

Mr. SCHROEDER. I am not sure they were getting all of their fuel, but they were getting a good share of it.

Mr. CHENOWETH. They had it perfected to a pretty fine point, then?

Mr. SCHROEDER. I do not feel that way at all. I think they had just taken a process which came out of a laboratory and they had built some plants. I would say their position was just a starting position.

Mr. CHENOWETH. They were not ahead of us at all?

Mr. SCHROEDER. In 1940 they were definitely ahead of us. I think now they are definitely behind us, because they have not been doing much work in this field in the last 10 or 15 years.

Mr. CHENOWETH. Doctor, I get the definite impression, as a member of this committee interested in coal, interested in finding further uses for coal, developing the coal markets, that it is your observation to this committee there is no immediate prospect that we are going to go to producing synthetic fuel from coal in this country; therefore that program does not offer any immediate hope for additional markets for the coal industry. Is that correct?

Mr. SCHROEDER. If by "immediate" you mean in the next few years, you are absolutely correct.

Mr. CHENOWETH. I have enjoyed seeing you again, Doctor, and appreciate the opportunity to get your further observations.

Mr. SCHROEDER. I have enjoyed talking to you.

Mr. CHENOWETH. Thank you very much.

Mr. EDMONDSON. Dr. Schroeder, in the event the Middle East oil supply were to be cut off, would you revise that statement regarding the immediacy of the prospects of developing synthetic fuels?

Mr. SCHROEDER. It certainly would change the picture enormously.

Mr. EDMONDSON. I think you have given us a splendid statement. There is one line of questioning I would like to develop before closing.

Certainly it seems to me from the testimony, both from the United Mine Workers and your testimony and other witnesses, that mechanization has been a big factor in the coal industry. Is there today, or has there been, any program of Government financing to assist in mechanization in the coal industry, that you know of?

Mr. SCHROEDER. I do not think there has been any substantial amount of contribution. Most of this work was done by the industry itself.

The Bureau of Mines did do some work on a coal planer, which was an idea brought back from Germany, I believe, and they cooperated with a company down in West Virginia on testing that piece of equipment. There was some Government money in that, I am sure.

Mr. EDMONDSON. In the installation of the mining machinery that has been developed that has greatly increased the efficiency of the average miner, has there been any Government loan program or assistance that you know of?

Mr. SCHROEDER. Not that I know of.

Mr. EDMONDSON. Would it be accurate to say that one of the principal reasons many of these mines are shut down today, one of the principal reasons, is the lack of financing to mechanize to enable them to compete successfully with mechanized mines?

Mr. SCHROEDER. That is a field that is a little outside of my work, but I would be inclined to agree with you on that.

Mr. EDMONDSON. Do you have a question you want to ask, Mr. Saylor?

Mr. SAYLOR. The only place I know there was any Federal money involved, as far as the coal mines were concerned, was at the time of the Korean incident, and due to the shortage of coking coal the Department of Defense, together with certain other agencies of the Government, authorized loans to certain coal companies of funds for the erection of, not a new modern-type coking plant, but for the erection

of some of the old beehive coke ovens. That was on a loan basis. I think it was on a loan secured by the company erecting these, and paying it back over a period of years.

Mr. SCHROEDER. Yes; that is correct.

Mr. SAYLOR. That is the only example, the only instance, I know of in which there was any Federal money made available to any segment of the coal industry, and that was to relieve the complete breakdown of the steel companies in not having enough coke.

In other words, we did not have the steel, we could not spare the steel to erect modern coke ovens. What are they called?

Mr. SCHROEDER. Byproduct ovens.

Mr. SAYLOR. Yes; byproduct type of coke ovens.

Mr. EDMONDSON. I want to express my appreciation to you, Doctor, for the very fine testimony you have given us this morning.

I think you have been a great help to us, and the committee appreciates it very much.

Mr. SCHROEDER. Thank you.

Mr. EDMONDSON. The committee stands adjourned.

(Thereupon, at 11: 50 a. m., the committee adjourned, subject to the call of the Chair.)

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